

NRCS Spot Check Supporting Documentation
Potomac Watershed Remote Sensing Pilot Project

Requested By:

Chesapeake Bay Agricultural Workgroup

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PA Potomac Remote Sensing Pilot Spot Check Documentation

Background

Following the collection of the remotely sensed data, an in-field spot check procedure was used to assess if the remotely collected information was accurate. The field data collectors had access to the following practice standards and overview to assist in visual assessment of the practices:

Section IV. Field Office Tech Guide

<https://efotg.sc.egov.usda.gov/treemenuFS.aspx>

National Handbook of Conservation Practices

https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/cp/ncps/?cid=nrcs143_026849

Spot checks were conducted on a whole farm/agriculture operation basis. Using information from the Census of Agriculture the number of farms in each of the pilot counties was established. The ratio of Potomac watershed acres to total county acres was used to establish the number of farms to be spot checked in each county.

Each county in the pilot project area would receive a 5% spot check. Franklin County was spot-checked at a 10% rate due to the diversity and density of agricultural operations.

A total of 201 farm/agriculture operation were spot checked in the following counties:

Somerset 6, Bedford 18, Fulton 22, Franklin 126, Adams 29

Training

Field Data Collectors conducting the on farm spot check procedure were highly experienced retired NRCS or Conservation District staff. For example, Ernest Tarner was a conservation district manager for 30 years and worked with conservation district and NRCS staff regularly to plan and implement conservation practices through state and federal programs. Rob Knight was a NRCS soil scientist who has more than 40 years of experience in conservation planning, soil surveys, and assessing conservation practices. Edgar White is a former NRCS State Soil Scientist and Acting State Resource Conservationist and was a former instructor of the PA NRCS Conservation "Boot Camps" and instructed many conservation district and NRCS staff on conservation planning and the design and implementation of conservation practices. Tim Emenheiser has more than 37 years of experience in various capacities planning, designing and implementing conservation practices and is currently a conservationist (ACES/NOWCC) for the Carlisle and Chambersburg Field Offices laying out conservation practices such as grassed waterways, buffers, stream crossings and manure/heavy use area projects. Tim is also a consultant for the Capital Area RC&D for the cover crop and conservation tillage surveys. John Akers has more than 38 years in the soil conservation in central Pennsylvania in various positions including conservation planning and conservation practice installation such as layout, survey, design and supervise construction of grassed waterways, diversions, terraces, contour strips farm ponds, wetland development, subsurface drainage systems, agriculture waste storage structures and associated water management practices. John is also currently assisting the Pennsylvania Bureau of Farmland Preservation with on-site farm visits to verify that preserved farms are implementing the conservation practices in the conservation plans.

Because of the extensive experience of the staff completing this work a detailed process describing how to identify an individual conservation practice was not needed. However, if necessary, any of the Field Data Collectors were able to refer to the Conservation Practice Standard Overview sheets which are attached. All staff were highly knowledgeable of NRCS practices.

A one day training session was held for all staff completing spot checks. The training consisted of two parts. All staff conducting in-field spot checks were present as well as NRCS state and field office staff. An invitation was also extended to partners to attend and Andy Zemba (PA DEP) attended the in-office portion of the training.

Part 1- In-office Training

The in-office training reviewed the requirements for the spot check procedure. An example of the information package to be provided for each farm was reviewed. NRCS GIS staff also provided a review of the remote sensing data collection procedure that was used to identify conservation practices using aerial imagery. An example farm map was shown in GIS format with the conservation practices delineated. The three functions of the spot check were defined and reviewed (see Spot Check Procedure below). The post spot check process was reviewed as well as the process to return the completed field sheets to the state office. There was also question and answer time to ensure that everyone understood the procedures.

Part 2- On-farm Training

The on-farm training began with a review of the in-field data collection procedures by the PA NRCS Staff Office staff. Then the Field Data Collectors completed a whole farm inventory and performed the spot check procedure on a farm located in Adams County PA. The Field Data Collectors and NRCS State Office staff walked the farm together and discussed the various conservation practices installed on the farm. The team worked as a group comparing the remotely sensed data collected with practices observed on the farm in the field. The map was marked-up in the field to reflect any additions or deletions to the data. Field observation notes were recorded on the map to provide additional clarification and as standard operating procedure. There was much discussion regarding the practices, how to record the practices, taking notes and the quality of notes, and how to use the "Talking Points" developed to inform the landowner of the project and desired outcomes. Some of the practices identified during the on-farm training were strip cropping, grassed waterway with a stone lined outlet, stream crossing with access lane, riparian forested buffer, stream fencing, watering trough and cover crop.

Summary of training session:

Staff arrived at location, met with local NRCS staff. Confirmed that we had permission from landowner to access the property. NRCS state office staff passed out training packet to participants. This was a sample package of materials that would be issued for each spot check locations. NRCS state office staff previewed the spot check training procedure.

Staff used the maps provided containing the remotely sensed information to orientate themselves to the operation. All parties reviewed the practices on the map that would need to be spot checked. Reviewing the map of the entire operation the most efficient path to review all fields was determined. As staff proceeded through the fields they made notes and made visual observation.

The first practice to be spot checked was a stream crossing. Staff made a visual assessment of the practice and the noted location on the map. The information collected by remote sensing was confirmed. Staff continued to walk the remainder of the farm confirming the existence of all practices identified. The staff noted a two practices that were not identified during the remote sensing data collection. One was a CREP planting and a second was a fenced heavy use area. For these practices, as

reviewed during the training sessions, the staff mapped the location of the practices on the map and made notes if applicable.

Concluding the field walk the group met to discuss the training session. Spot check staff provided comments and asked a few clarification questions. Concluding the in the field portion of the training session both staff and state office trainers were confident that the spot check process were effective for achieving the goals of the spot check. Staff were comfortable with walking the farm, talking to the landowner and identifying BMP's.

Spot Check Procedure

Farms to be spot checked were selected by using a random point cloud generated in ArcMap. The spot check locations were selected by county, but were limited to the area of that county within the Potomac watershed.

Each Field Data Collector was assigned a group of farms to spot check. Prior to performing the field observations State Office Staff provided an information package for each farm. This packet contained the remotely sensed practices on aerial photography, the Common Land Unit (CLU) boundary, if available, the Farm and Tract number, USDA Farm Service Agency (FSA) reports, and pertinent owner/operator information.

During the spot check, Field Data Collectors would perform up to three functions:

1. Confirm that the remotely sensed practice was identified and delineated correctly.
2. Mark on the map any additional conservation practices that were identified on the farm that were not collected remotely; and
3. Mark on the map any conservation practices that were remotely collected, but could not be identified in the field.

Visual Confirmation

This was a visual confirmation that the conservation practice identified during the remote sensing portion of the pilot was able to be seen on the ground by the Field Data Collector. The Field Data Collectors used visual cues, their knowledge base as professionals, and the Conservation Practice Standard Overview Sheets to determine the existence of the conservation practice.

Addition of Conservation Practice

This occurred when a conservation practice was observed during a field visit that was not identified during the remote sensing collection. The Field Data Collectors made this determination based on the map provided to identify the practice and location. The additional conservation practice was marked on the map and if attribute data was able to be determined, it was noted in the field notes. Following the field visit, the field maps and notes were returned to the state office. These additional conservation practices were added to the database, attributes were entered if available, and geospatial attributes were calculated. These practices were identified in the database as obtained through field collection, "Field Collect" FC.

Removal of Conservation Practice

This occurred when a conservation practice that was identified during the remote sensing portion of the pilot was not able to be visually identified at that location and the Field Data Collectors utilizing the maps provided, were not able to locate the practice on the landscape. These conservation practices were marked on the field maps and noted. Following the field visit, the field maps and notes were returned to the state office. These practices that could not be confirmed were marked as "Delete" in the database and were excluded from the data processing.

NOTE: Determining level of practice functionality, identifying if NRCS practice standard and specifications were met was not within the scope of the pilot project and was not an aspect of the spot check procedure.

Professional Staff

ERNEST D TARNER

All BMPs were visually site inspected at each tract

30 years as District Manager Franklin Co. Conservation District-Ongoing training with State and Federal programs

Two week course on storm water management and storm flow design at Penn State

Gave lectures on State Law and Storm Water at Shippensburg University

Certified in Environmentally Sensitive Maintenance of Dirt and Gravel Roads-September 28, 2010

Level Two in Land Management and Water Control Erosion and Sediment Control from National Institute for certification in Engineering Technologies

Certified Sewage Enforcement Officer 1971-1995

Eleven years at Arrowood Inc. Civil Engineer Duties including Designs of 10,000 Gal/ Day sewage systems for campgrounds, housing developments and surveying

Taught night school at Franklin Co Vo-Tech (Drafting)

Completed course at Shippensburg University on Landforms and Landscapes/ Rocks and Minerals (1975)

Example Site visit

Drove to tract, met and interviewed owner

Waste Storage Facility (313)

1. Visual Observation of Storage
2. Checked slab for concrete construction
3. Checked retaining walls for concrete construction
4. Site review of grade around storage

5. Visual observation of cover (grass) and grade

Grassed Waterway (412)

1. Walked Waterway in field
2. Checked for perennial grass cover if present (75%)
3. Checked on shape of waterway for storm flow

Trails and Walkways (575)

1. Walked trails and walkways for site review
2. Checked fencing and cover on walkways
3. Checked surface water flow around walkways and trails

ROB KNIGHT

Familiar with all the counties I conducted investigations.

Previously worked as a NRCS soil scientist in all the counties within the study area.

Soil survey involved field examination of landscapes, conservation practices as well as soils and mapping results on aerial photographs.

Over 40 years of experience in conservation including farm planning, soil survey, photo interpretation.

Over the years taken a number of remote sensing courses, Including photo and digital imaging.

General note for the project:

I examined as many aerial photos as I could find on known practices. Consulted local expert conservationists and technicians to confirm many of my calls. Previous field experience in the work area. Field checking of the most difficult to ID practices. On farms active in NRCS and FSA programs, I was able to check with field staff through email, phone or in person. Review of NRCS farm plans and FSA reports. Digital and hard copy.

General Resources:

Aerial photos of various years from numerous sources including USGS, NRCS, Google Map, Digital Globe to name a few.

Topographic rasters

Lidar, Digital Elevation Models products, such as contour and curvature maps.

The numbers below correspond to the numbers in the 3rd column (Practice Note) of the spreadsheet.

1. Looked at various years of the best contrasting photography. Detective work to decide the month and year of practice implementation. These were the easiest practices to identify.
2. Aerial photos aided by Lidar products aided in ID and delineation. Color and intensity were key.

3. Cover crops were ID by looking at the photography of the year and time of year in question. This was a difficult practice to ID because of grassland / hay land or other plant growth that gave a false positive. Researching Farm Service crop reporting and NRCS file data helped.
4. An aerial photo with very good contrast aided the ID. Various photos of different perspectives were best because point practices could be obscured by tall vegetation or in some cases buildings or other structures.
5. Very difficult to ID. The notes from NRCS toolkit and other aided
6. Cropping patterns and animal/equipment traffic patterns helped in identification.

Practice Code	Practice Name	Practice Note
313	Waste Storage Facility	1
316	Animal Mortality Facility	4
317	Composting Facility	4
330	Contour Farming	1
331	Contour Orchard and Other Perennial Crops	1
332	Contour Buffer Strips	1
340	Cover Crop	3
359	Waste Treatment Lagoon	4
362	Diversion	2
380	Windbreak/Shelterbelt Establishment	1
382	Fence	6
386	Field Border	4
391	Riparian Forest Buffer	4
412	Grassed Waterway	1
468	Lined Waterway or Outlet	2
472	Access Control	4
528	Prescribed Grazing	4
558	Roof Runoff Structure	5
561	Heavy Use Area Protection	1
574	Spring Development	4
575	Trails and Walkways	2
585	Strip cropping	1
600	Terrace	2
601	Vegetative Barrier	1
612	Tree/Shrub Establishment	1
629	Waste Treatment	4
635	Vegetated Treatment Area	1
638	Water and Sediment Control Basin	4

ED WHITE

University of Maryland- B.S. Agronomy 1973, + 20 Hours of Graduate School Classes

1975- 2010 Soil Scientist USDA-SCS/NRCS. State Soil Scientist in PA from 1996-2010, supervised GIS Staff, Customer Service Toolkit Staff leader, IT Staff, served as Acting State Resource Conservationist. Attended Conservation Boot Camps and Sediment and Control training (as an instructor).

2011-2016- as Contractor with Capital RC&D completed on site inspections of USDA preserved farms in S. Central and S.E PA. Inspected farms for compliance with Easement Deed including reviewing conservation plan and field inspection of conservation practices.

Practice Identification

For each practice listed during the field inspections, I determined if the practice meet the purpose and criteria listed in the Conservation Practice Standard. I did this mostly by looking for any issues that might/would be the result of inadequate design, construction or maintenance.

Examples such as erosion within or beside grass waterways or plow skip waterways, bare, sparse or weedy vegetation. Looked for evidence of leaking, over topping or seepage areas around manure storages. Runoff evidence near dry storage or overtopping of gutters. Erosion, bare areas, broken fencing in pasture areas or areas indicating over use/concentration of animals. Evidence of overtopping or erosion around diversions, terraces. Condition of outlet. Status of cover crop growth and uniformity of seeding. Interviewed landowners if they were available on day of visit. Stream Crossings- observed status of fencing and areas around entries and exit points. Stream buffers-checked status of vegetation along stream whether herbaceous or woody.

JOHN AKERS

I started with Soil Conservation Service at Brookville in Jefferson County as a Soil Conservationist in 1961. Early in 1962 I was transferred to Leesport in Berks County to continue my training. Later in 1962 I was transferred to Lewistown in Mifflin County as the Work Unit Conservationist now District Conservationist. In 1967 I was transferred to Meadville in Crawford County and served there until 1974 when I was transferred to Chambersburg in Franklin County. I retired while still in Chambersburg in 2000. Since then I have done some part-time work with the Bureau of Farmland Preservation in doing on-site farm visits to check if the preserved farms are implementing the conservation practices in the conservation plans. After moving to Bedford County in 2006, I have served as an Associate Director for the Bedford County Conservation District and was appointed as a District Director three years ago.

As a District Conservationist I developed conservation plans with land owners and also helped them install the planned conservation practices. This included laying out contour strips, layout, survey, design and supervise construction of grassed waterways, diversions, terraces, farm ponds, wetland development, subsurface drainage systems, ag waste storage structures and associated water management practices. I also planned and implemented rotational grazing systems on a number of farms and was active in setting up no-till farming systems with crop residue and cover crop management.

The Potomac River watershed in both Bedford and Fulton Counties are generally not high intensity farming areas. This means that a number of farms are being rented out, some are farmed by farmers

who also work off the farm and a few farms are owned by people who do not live on the farms. What this means is that in some cases I got to talk to the actual farmer, sometimes a spouse or other family members and in some cases no one was available to talk with.

The grassed waterways were generally in good condition with little or no damage from herbicides and showed no signs of erosion in the waterway itself. Grassed waterways in hay fields had a different grass cover than that found in the near-by hay fields. The waterways were constructed with adequate width and depth to handle projected run-off and to allow easy equipment crossing.

Contour and field strips were sized to handle runoff from the existing field slope. That is steeper slopes had narrowed strips and less steep slopes usually had wider strips. Corn and soybeans were alternated with hay or small grain crops.

Ag waste storage structures were lined earthen ponds or concrete structures. A couple of manure storages were built under the livestock barns. All appeared to be maintained properly and emptied regularly. Some were also collecting runoff from nearby barnyards or feeding areas.

Stream crossings were usually stone rip-rap or concrete and had fencing on both side to keep the cattle on the constructed crossing. The stone rip-rap went up on the stream banks to provide stable footing and reduced soil erosion.

Riparian buffers were usually thirty or more feet wide with fencing to keep cattle out of the stream. Most buffer areas were usually covered in native vegetation with some having trees planted in them.

There were some diversions and a few cropland terraces. The diversions were being maintained in a grass cover and appeared to be effective in diverting surface water from crop areas below them. The water drained into waterways or woodlands. Cropland terraces were being farmed with the crops grown in the adjoining cropland and moving any surface water to grassed outlets.

When I did this survey last fall I observed one field on the Bedford farms and one field on the Fulton farms that had done fall plowing. Both fields were in strips, so that any erosion from the plowed strip would be captured in the adjoining grass strips. This is a very great reduction of fall plowing from years back when farmers plowed fields in the fall for planting spring crops. With more no-till farming being done, there is less need for plowing fields.

This reduction in fall plowing was confirmed this fall when I helped with the transect cover crop survey for Capital RC&D in Cambria, Blair, Bedford and Fulton Counties. To only see a couple of fields in each county with fall plowing is showing a great change in farming practices and I would think a great reduction in surface water run-off and a great reduction in soil erosion from crop fields.

TIM EMENHEISER

37 years of service (1972- 2008) in 9 different positions in Pennsylvania. Most of the time I was involved in the implementation of conservation practices and the development of conservation plans throughout the state.

Spent the final 7 years (2001- 2008) as the state Soil Conservationist in charge of the conservation planning certification program.

Have worked the past 8 years (2008- present) as a conservationist (ACES/NOWCC) for the Carlisle and Chambersburg Field Offices laying out conservation practices such as grassed waterways, buffers, stream crossings and manure/heavy use area projects.

Work as a consultant for the past 8 years for the Capital Area RC&D involving cover cropping and conservation tillage surveys.

I have extensive experience in not only laying-out the conservation practices listed in the SOW but also in identifying where the practices should be placed on the landscape in the first place.

Chesapeake Bay Watershed Remote Sensing Project Lessons Learned

Project Set Up & Design

- More open communication between the sponsors regarding project design
- Better comprehension of data needs
 - o What attributes to collect
 - o How collected attributes will fit into the model
- How to conduct spot check? on a per farm basis or practice basis?
- Credit for a Conservation Plan or individual practice
- Better crosswalk between Bay Model Definition and NRCS Practice Definition
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Field Data Collection

- Provide a more formal on farm training and review of the:
 - o Conservation Practice Standard Overview fact sheets
 - o National Handbook on Conservation Practices
 - o Desired format and quality of notes on the photo base capturing their decision relating to the BMP's
 - o Develop Check List of Visual Indicators for the data collector's reference.
- Review the field data collector's work periodically throughout the process for quality assurance.
- Periodic meetings with Remote Data Collectors to review findings.
- Incorporate the use of LIDAR products into the data collection process

Remote Sensing Data Collection

- Develop a photo catalog to illustrate common practices within the Chesapeake Bay Watershed. Both Aerial Photos and close up still photos.
- Provide Remote Sensing Lab with copies of the field data collection sheets so they can use that information to refine their skills.
- Conduct periodic meetings with Remote Sensing Lab and Field Data Collectors to compare notes and discuss photo signature associated with particular practices.

Incorporate the use of LIDAR products into the data collection process