Step 9. MAKE ADJUSTMENTS

After you've put your nutrient management plan into action, and completed the monitoring and record-keeping, you're in a position to determine which decisions in the plan worked well and which did not.

If significant cropping or livestock management changes are planned, you're advised to rerun NMAN so that the nutrient management plan will reflect these changes.

A nutrient management plan is a living document intended to change with time and technological advances, and with a better understanding of the processes involved. It is most important to evaluate how well the plan met the goals you set for it (Step 1).

As you contemplate making adjustments, remember to follow the systems approach to management.

Making adjustments to the plan is similar to repeating Steps 3 to 6 – the analysis, interpretation, decision and action processes. The end result will be a revised plan, ready for implementation.

When reviewing or making changes to your plan, bear in mind the factors that may affect where changes are made. Consider:

- personal changes that may affect long-term goals, labour availability, etc.
- greater understanding of the principles that may affect whether you or a consultant revises the plan
- market forces that may affect the livestock raised, crops grown, end use of products generated (including manure), acres of various crops, etc.
- changes in the community (e.g., urban growth closer to the farm), bylaw changes and new regulations that may affect your operation
- manure sample analysis that may have changed since the initial results used for the original plan
- subsequent soil analysis that may show nutrient balance increasing over time
- commercial fertilizer rates or manure rates that may have to be modified based on results from side-by-side comparisons
- new technology that may affect application rate or timing (e.g., application equipment, livestock ration options, storage process such as anaerobic digesters or composting)
- purchase or rental of additional land base, or the addition or suspension of manure agreements.

Adjustments are made constantly in farming based on new ideas, new products or technology, coffee-shop talk, regulations, an advertising blitz, or just the need to try something different.

In nutrient management planning, adjustments are made from a systems perspective – using observations, record-keeping and monitoring information to reinterpret actions and decisions.

COMMON AREAS FOR ADJUSTMENT

CHANGING TIMING AND TECHNIQUE

Changing the time of application may require other changes.

Consider the case of a layer operation with liquid manure and a heavy clay land base that has been in a no-till system for over 10 years. The egg producer tries to late-summer apply the manure in order to avoid compaction problems and to make best use of the nitrogen in manure. After the first year, the application equipment is adjusted so that the injection units will leave the soil more level and the injection paths covered.

The adjustment is made because the equipment was not designed for the heavy clay conditions or the dry soil conditions. Although consideration could be given to changing the timing of application or the tillage (from no-till to conventional), some management decisions are cast in stone and manure management must work around them – sometimes with compromises.

Changing the timing of application to a side-dress operation may require equipment changes.

NEW TECHNOLOGY

Equipment

Farmers are skillful at modifying equipment to make it work for specific conditions, and manufacturers are looking for these new ideas for development of new technology – whether for no-till, zone till or for manure application equipment. Don't hesitate to ask and work with manufacturers and dealers to ensure the equipment purchased meets the needs and conditions of the farm.

Composting reduces manure volume, odour and pathogens.

Manure treatment

When problems are identified, chances are that research can offer solutions to problems. For example, large operations with not enough land base have the option of alternative treatment systems such as composting or anaerobic digestion. Composting is a process that when completed (i.e., when compost is cured), reduces the volume, odour and pathogens compared to its raw form. Anaerobic digestion is a process that converts some of the carbon to energy and also reduces odours and pathogens. Both processes can be expensive and labour-intensive. Investigating the results of local demonstration projects and current research (done under similar climate, management and political conditions) is a good method of determining whether or not this is an economic option for your farm.

Monitoring and record-keeping

Computer-based and remote-sensing techniques have been developed to improve calibration, resource and input monitoring, as well as record-keeping.

Prudence and accountability are at the core of monitoring - with or without modern technology.

Let's say a farm with a major stream meandering through several cornfields is prone to flooding. A custom applicator with a global positioning system (GPS) is chosen to apply manure to those fields. The applicator has a flow meter that tracks application rate as well as a positioning system that tracks exactly where manure has been applied.

A map can be produced to verify setback distances. The data can be used by the local fertilizer dealer to compensate areas that did not receive manure with commercial fertilizer.

Sampling frequency

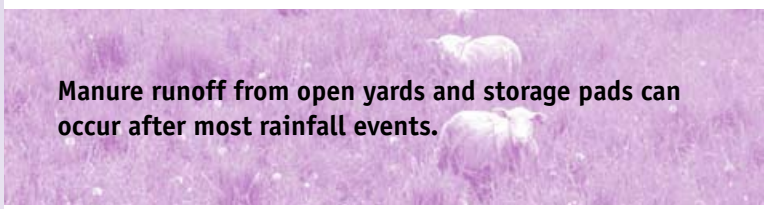
How often should you sample manure?

- each time the storage is emptied until you're satisfied that there is consistency in analysis results
- each time that you change your livestock type, rations, bedding or manure storage or other management that affects manure characteristics.

Note the implications for your nutrient management plan and its implementation. This could mean different manure application rates, adjustments to fertilizer use, and, if significant, adjustments to timing and separation distances.

How often should you sample soil for analysis?

- every three years, or
- at the same point in rotation, or
- after major changes in nutrient application.



Manure runoff from open yards and storage pads can occur after most rainfall events.

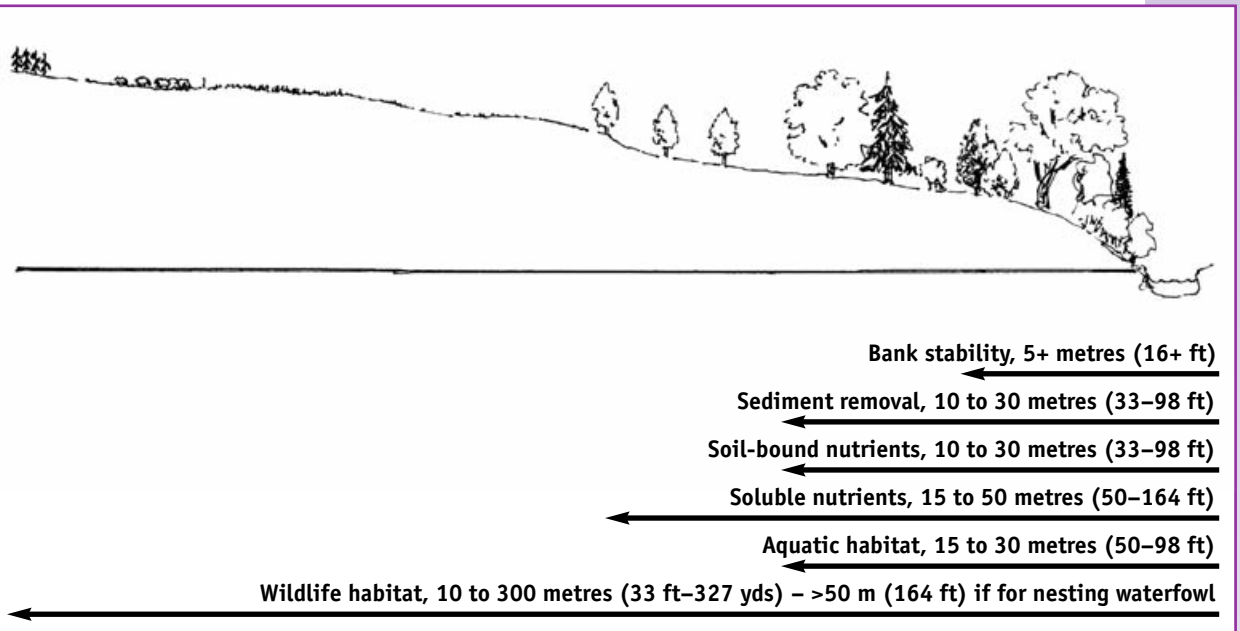
CASE STUDY FARM – VEGETATED BUFFER

After intense rainfalls, if the soil in the field erodes and the streambank slumps, the need for a vegetated buffer is evident. One adjustment to the plan would be to install a 15-ft vegetated buffer with the goal of bank stabilization. A drop structure could be considered to repair the gully.

A switch to conservation tillage and maintaining 30% surface residue should also help to reduce soil erosion. Future monitoring of erosion and sedimentation to determine the effectiveness of 15-ft vegetated buffer will help determine if the buffer should be increased to 30 feet or if a grassed waterway to handle concentrated flow would be more effective.

Use the diagram below to choose the function and suitable width of a planned buffer strip.

A properly sized and established grassed buffer strip will help reduce the amount of manure runoff from croplands that reaches a watercourse.



STARTER FERTILIZER ECONOMICS

Another adjustment considered in 2003 and 2004 was the use of starter fertilizer. With a P soil test between 40 and 60 ppm, it seemed necessary to determine whether or not the starter fertilizer was required.

In a replicated side-by-side comparison, there was no yield difference where starter was used and where it wasn't – both strips yielded 145 bu/ac.

The starter material going through the fertilizer boxes on the planter was 150 lbs/ac 8-32-16 at a cost of approximately $18.00/ac. By not using starter fertilizer, the application rate could go from a current maximum of 4,500 gal/ac to 6,250 gal/ac.

If soil tests were in the medium range, and a producer wasn't comfortable with eliminating the starter fertilizer, then the option of liquid seed-placed starter at a low rate (4 gal/ac) could be tested in a side-by-side comparison for several years.

Impact of side-by-side in making adjustment

The owner of the case study farm is looking at including wheat in the crop rotation. His decision will be based on whether manure could be utilized on the wheat crop. The farmer, in co-operation with his neighbour, did a side-by-side to help make the decision.

After interpreting the information, they decided to try this comparison for one more year to examine the results from a drier year. Based on one comparison, the decision to include wheat in the rotation looked promising.

MANURE ON WHEAT SIDE-BY-SIDE COMPARISON
Treatments

- **A** Full manure with AerWay®
- **B** Full manure surface-applied
- **C** 2/3 rate manure with AerWay 1/3 fertilizer N
- **D** Fertilizer N only
- **E** Manure @ 133% N rate (120 N)
- **F** Manure 67% N (60 lbs. N)

Target Nitrogen Rate: 90 lbs/ac

PLOT LAYOUT – NORTHEAST CORNER

	A 1	B 2	C 3	D 4	E 5	F 6	A 7	D 8	B 9	E 10	C 11	F 12	E 13
YIELD (BU/AC)	73.3	76.2	68.1	72.8	87.4	71.6	73.6	79.9	83.6	84.7	75.0	68.2	72.5
MOISTURE %	14.4	14.8	14.6	14.9	14.3	15.0	15.1	15.4	15.1	14.8	15.2	15.3	15.2
ACTUAL N APPLIED	124	124	103	90	146	73	107	90	107	142	101	71	142

Plot summary:

90 lbs Manure N with AerWay (3,000 gal/ac):	73.4 bu/ac	14.75 % moisture
90 lbs Manure N surface-applied (3,000 gal/ac):	79.9 bu/ac	14.95% moisture
60 lbs Manure N (AerWay, 2,000 gal/ac); 30 lbs commercial N:	71.6 bu/ac	19.90% moisture
90 lbs Commercial fertilizer N:	76.4 bu/ac	15.15% moisture
120 lbs Manure N with AerWay (4,000 gal/ac):	81.5 bu/ac	14.76% moisture
60 lbs Manure N with AerWay (2,000 gal/ac):	69.9 bu/ac	15.15% moisture

Additional Information

- 60-ft wide plots
  - 975 to 1625 ft plot length, longer plots on south side of field
  - combine header 17.5 ft with middle 35 ft of each plot combined
  - wheat planted Oct 15th –19th – Pioneer® 25R26
- manure (and commercial N) applied May 15 (30-ft application width) (overcast, 11 °C., moist to wet soil conditions)
- wheat harvested August 9
- fusarium levels > 1.5% (roughly estimated between 2.5 and 3.5%) samples submitted for protein and fusarium testing weeds pressure (moderately weedy)