



Prairie Agricultural
Machinery Institute

DETERMINING OPTIONS TO LOWER MECHANICAL OVERLAP IN SINUOUS RIPARIAN AREAS

Natural Runoff or Creek Obstacles

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Introduction

Riparian areas and wetlands provide many benefits that work towards a balanced and healthy landscape, including water quality, biodiversity, reduced erosion, and wildlife habitat. Efficient agricultural crop production means effective use of time and resources to minimize overapplication of seed, pesticides, and fertilizers while also reducing fuel use. Environmental stewardship retains and properly manages riparian areas and wetlands in order to maintain their natural function.

Irregular shapes of a farmable area increase overlap (the amount of turning required during field operations) and can result in overapplication of seed, pesticides and fertilizers, increased fuel consumption (and thus emissions), and increased work time.

To aid professional staff and producers in selecting ways to minimize overlap without removing or reconfiguring critical natural elements, fact sheets were created. In this fact sheet, a production area with a natural runoff or creek obstacle impacting overlap is discussed and, to aid in overlap illustrations, a specific example is used.

Glossary of Terms

PERIMETER OVERLAP – Mechanical overlap experienced on the headlands of cropland.

OBSTACLE OVERLAP – Mechanical overlap experienced as an implement traverses around an obstacle in its pass of travel.

THEORETICAL OVERLAP – The best case scenario for mechanical overlap on a parcel of land by assuming “no” overlap is seen per pass traveled on the land, and all overlap is associated with perimeter (headland) overlap.

Site Description

The agricultural cropland was a quarter section with natural runoff ditches or creek obstacles. **Figure 1** represents the field in discussion.

Factors to note when calculating overlap and respective information regarding this study:

Farmable acres — 151.84

Equipment — 47 foot air seeder

Operation — no assisted tracking or auto steer

Recorded acres traveled — 175.47

Overlap acres — 23.63 (15.56%)

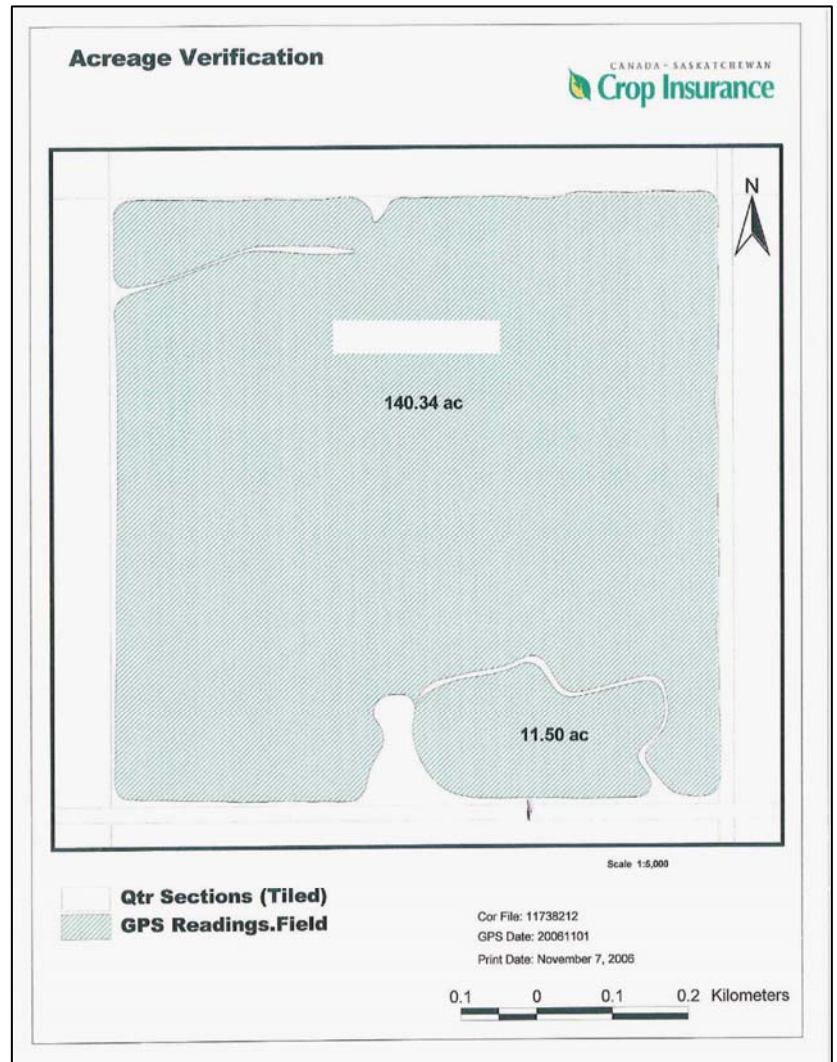


Figure 1. Case 4 - Natural Runoff or Creek Obstacles.

Overlap-Reduction Options

1. Auto Steer

The most relevant method to significantly reduce overlap on this quarter section of cropland would be to employ some form of auto steer technology. The theoretical overlap calculated on a quarter section of land with two significant obstacles is 5.09%, which equates to 7.73 acres. Achieving the theoretical overlap would decrease overlap by 10.47% or 15.9 acres. Using an average production cost of \$95/acre, an overlap reduction of 15.9 acres would result in a direct savings of \$1,510 without a loss of seeded acres.

2. Equipment Size

An additional option that would contribute to overlap reduction would be to utilize equipment with a smaller width in conjunction with auto steer technology. The theoretical overlap utilizing an implement less than 47 feet in width is shown in **Table 1**.

Table 1. Implement Width vs Theoretical Overlap.

Implement Width (ft)	Theoretical Overlap (%)
47	5.09
38	4.1
32	3.45
28	3.05
22	2.37

The information in this table indicates that by reducing the implement width by approximately half reduces the theoretical overlap proportionally. Using a 22 foot wide implement would theoretically decrease overlap by 13.19% or 20.03 acres. An overlap reduction of 20.03 acres yields a direct savings of \$1,903 without a loss of seeded acres using an average production cost of \$95/acre.

3. Isolation of Obstacles

An alternative option to assist in overlap reduction would be to isolate the area in the southeast corner of the quarter section where the creek extends into the production land. The isolation reduces the farmable area to 140.34 acres; however, it also reduces the number of obstacles in the field to one. The theoretical overlap on a quarter section of land with one interior obstacle utilizing an implement that is 47 feet in width is 4.55% or 6.39 acres. Achieving the theoretical overlap would decrease overlap by 17.24 acres. However, there would also be a loss of 11.5 acres of production land. Using an average production cost of \$95/acre, an overlap reduction of 17.24 acres would result in a direct savings of \$2,345. The loss of 11.5 acres of cropland would provide offset savings of \$1,564 to go towards the production loss associated with the 11.5 acres.

4. Equipment Size Plus Isolation of Obstacles

Utilizing an implement 22 feet wide further reduces the theoretical overlap if the quarter section had only one interior obstacle. The theoretical overlap calculated is 2.13% or 2.99 acres. Reaching the theoretical overlap would provide a reduction of 20.64 acres. However, there is still a loss of 11.5 acres of production land. At an average production cost of \$95/acre, an overlap reduction of 20.64 acres would result in a direct savings of \$2,807, and the removal of 11.5 acres of productive land provides a further offset of \$1,564 to go against the prospective income loss from the crop yield on the 11.5 acres.

It is possible that alternative uses for the land taken out of crop production could be found. Using the land for hay or grazing may provide alternate income streams or securing its use for wildlife habitat could present environmental and social benefits.

Conclusion

Each producer will need to tailor these options to reduce overlap in his/her particular situation. However, in this example, the most viable option to achieve the theoretical overlap on a quarter section with a creek or a natural runoff area going through it would be to employ GPS tracking technology with an auto steer on the existing equipment for the following reasons:

- It allows for integration seamlessly into the existing business unit.
- It requires no investment into new cropping equipment by implementing a smaller equipment strategy.
- It is a technology investment that can be used on equipment at each stage of the cropping process, so there is an option to compound its impact.
- It has the ability to assist in time management during each stage of the cropping process because field time can be extended if field conditions are favourable.
- It is a relatively low cost investment as compared to converting the land to forage and investing in haying equipment.

To further reduce overlap utilizing the existing equipment, the producer managing the agricultural cropland has the option of isolating the southeast corner of the cropland where the creek encroaches. The option of isolation would need to be measured against the loss of 11.5 acres of crop land, as there is a limited calculated gain in overlap reduction of 1.34 acres in this situation. Alternative uses for the 11.5 acres that may provide a return on the land to be investigated are:

- Forage production.
- Tree production.
- Native fruit production.

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