NORTH DAKOTA IRRIGATION GUIDE

Version 1.4

Irrigation Group: 1i
Irrigation Class: Irrigable
Old Irrigation Group: 10

Slope: ≤ 6 percent [1/]

Drainage: excessively drained

Surface texture: L, SL

Substratum texture: sand and gravel

Surface intake rate for sprinkler irrigation: 0.5 – 0.7 in/hr

Limiting permeability within 40 inches: 0.6 to 2.0 in/hr in the upper part and > 6.0 in/hr in the lower part

Profile characteristics: shallow/very shallow (< 20 inches) to sand, gravel and porcellanite

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.5 inches
2 feet	2.0 inches
3 feet	2.5 inches
4 feet	3.0 inches
5 feet	3.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 – 10 inches

Surface pH: 6.6 – 8.4 inches

EC – (maximum within 40 inches in dS/m): 0

SAR – (maximum within 40 inches): 0

Typical Soils: Brandenburg, Coe, Ringling, Sioux, Wabek

_____

[1/]For slopes >6% refer to the water erosion hazard table.

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <12

Water Management Practices
Water management on these soils is critical because of low available water capacity and nutrient leaching hazard. An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 2i
Irrigation Class: Irrigable
Old Irrigation Group: 9

Slope: ≤ 9 percent [1/]

Drainage: moderately well to excessively drained

Surface texture: CoS, S, FS, LCoS, LS, LFS, CoSL, SL, FSL

Subsoil texture: FS, S, LCoS, CoS

Surface intake rate for sprinkler irrigation: 0.5 - >1.0 in/hr

Limiting permeability within 40 inches: 6.0 - 20.0 in/hr

Profile characteristics: sandy and moderately coarse textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.0 inches
2 feet	2.0 inches
3 feet	2.5 inches
4 feet	3.0 inches
5 feet	4.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 - 30 inches

Surface pH: 6.1 - 7.3

EC - (maximum within 40 inches in dS/m): 0

SAR - (maximum within 40 inches): 0

Typical Soils: Aylmer, Claire, Falsen, Lohnes, Serden, Seroco, Yetull, Zeona

_____

[1/]For slopes >9% refer to the water erosion hazard table

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <12

Water Management Practices
Water management on these soils is critical because of low available water capacity and nutrient leaching hazard. An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 3i
Irrigation Class: Irrigable
Old Irrigation Group: 8A

Slope: ≤ 6 percent [1/]

Drainage: moderately well to somewhat excessively drained

Surface texture: FSL, SL, CoSL, LFS, LS

Subsoil and substratum texture: SL and L in the upper part and LS to sand and gravel in the lower part

Surface intake rate for sprinkler irrigation: 0.4 - 1.5 in/hr

Limiting permeability within 40 inches: 2.0 - 20.0 in/hr in the upper part and > 6.0 in/hr in the lower part

Profile characteristics: moderately coarse and medium textured material in the upper part and coarse textured material in the lower part

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.5 inches
2 feet	3.0 inches
3 feet	3.5 inches
4 feet	4.5 inches
5 feet	5.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 - 30 inches

Surface pH: 6.1 - 7.8

EC - (maximum within 40 inches in dS/m): 0

SAR - (maximum within 40 inches): 0

Typical Soils: Arvilla [2/], Banks, Binford [2/], Hecla, Lihen, Manning [2/], Osakis, Ruso [3/], Telfer, Walum [2/]

[1/] For slopes >6% refer to the water erosion hazard table
[2/] Underlain by sand or sand and gravel within depths of 14 to 20 inches
[3/] Underlain by sand or sand and gravel within depths of 20 to 40 inches

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <12

Water Management Practices
An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 4i
Irrigation Class: Irrigable
Old Irrigation Group: 7A

Slope: ≤ 6 percent [1/]

Drainage: well and moderately well drained

Surface texture: SL, FSL, L

Subsoil texture: SL, FSL, L

Surface intake rate for sprinkler irrigation: .5 - 1.0 in/hr

Limiting permeability within 40 inches: .6 - 6.0 in/hr

Profile characteristics: moderately coarse and medium textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.0 inches
2 feet	4.0 inches
3 feet	5.5 inches
4 feet	7.0 inches
5 feet	9.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 - 20 inches [2/]

Surface pH: 6.1 - 8.4

EC -(maximum within 40 inches in dS/m): 0 - 2

SAR -(maximum within 40 inches): 0

Typical Soils: Breien [3/], Chinook, Egland, Embden, Mott, Tally, Trembles [3/], Velva [3/]

_____

[1/]For slopes >6% refer to the water erosion hazard table
[2/]Depth to lime may be <10 inches
[3/]May be stratified and have slower permeability rates

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <12

Water Management Practices
An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 5i
Irrigation Class: Irrigable
Old Irrigation Group: 6A

Slope: ≤ 6 percent [1/]

Drainage: well and moderately well drained

Surface texture: SL, L

Substratum texture: 2C material is GrSL to sand and gravel

Surface intake rate for sprinkler irrigation: 0.5 - 0.7 in/hr

Permeability within 40 inches: 0.6 - 2.0 in/hr in the upper part and > 6.0 in/hr in the lower part

Profile characteristics: moderately coarse and medium textured material over sand and gravel that is shallow to moderately deep (<40 inches)

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.0 inches
2 feet	3.0 inches
3 feet	3.5 inches
4 feet	4.0 inches
5 feet	4.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 - 20 inches

Surface pH: 6.1 - 7.8

EC - (maximum within 40 inches in dS/m): 0 - 1

SAR - (maximum within 40 inches): 0

Typical Soils: Brantford, Hidatsa, Kensal, Lehr, Renshaw, Warsing

---

[1/] For slopes >6% refer to the water erosion hazard table

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <9

Water Management Practices
An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 6i
Irrigation Class: Irrigable
Old Irrigation Group: 6B

Slope: ≤ 6 percent [1/]

Drainage: moderately well and well drained

Surface texture: L, SIL, CL

Subsoil texture: L and CL in B horizons and GrL to GrS in the 2B or 2C horizons

Surface intake rate for sprinkler irrigation: 0.5 - 0.7 in/hr

Limiting permeability within 40 inches: 0.6 - 2.0 in/hr in the upper part and > 6.0 in/hr in the lower part

Profile characteristics: moderately fine textured material over moderately deep(20-40 inches)sand and gravel

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	5.5 inches
4 feet	6.0 inches
5 feet	6.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 15 - 30 inches

Surface pH: 6.1 - 7.3

EC - (maximum within 40 inches in dS/m): 0 - 1

SAR - (maximum within 40 inches): 0

Typical Soils: Bowdle, Chanta, Fordville, Spottswood, Stady, Vang [2/]

_____

[1/]For slopes >6% refer to the water erosion hazard table
[2/]Vang soils may have lower pHs because of the influence of shale

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <9

Water Management Practices
An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 7i
Irrigation Class: Irrigable
Old Irrigation Group: 4A

Slope: ≤ 3 percent [1/]

Drainage: moderately well and well drained

Surface texture: VFSL, SIL, L

Subsoil texture: VFSL, SIL, L, SICL

Surface intake rate for sprinkler irrigation: 0.1 – 0.5 in/hr [2/]

Limiting permeability within 40 inches: 0.2 – 2.0 in/hr

Profile characteristics: medium and moderately fine textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	5.0 inches
3 feet	7.0 inches
4 feet	9.0 inches
5 feet	11.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 15 – 30 inches

Surface pH: 6.6 – 7.8

EC – (maximum within 40 inches in dS/m): 0 – 2

SAR – (maximum within 40 inches): 0

Typical Soils: Arnegard, Eckman, Emrick, Gardena, Shambo

[1/] For slopes >3% refer to the water erosion hazard table
[2/] SICL surface texture intake rate for sprinkler irrigation is 0.1–0.4 in/hr

Irrigation Water Quality
Maximum allowable EC <2250
Maximum allowable SAR <6

Water Management Practices
An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 8c
Irrigation Class: Conditional
Old Irrigation Group: 3A

Slope: ≤ 3 percent [1/]

Drainage: moderately well to well drained

Surface texture: L, SIL, SICL

Subsoil texture: L, CL, SICL

Surface intake rate for sprinkler irrigation: 0.1 - 0.7 in/hr

Limiting permeability within 40 inches: 0.2 - 2.0 in/hr

Profile characteristics: medium and moderately fine textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.5 inches
4 feet	8.5 inches
5 feet	10.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 - 20 inches

Surface pH: 6.1 - 7.8

EC - (maximum within 40 inches in dS/m): 0 - 4

SAR - (maximum within 40 inches): < 2

Typical Soils: Barnes, Makoti, Overly, Svea, Williams

[1/]For slopes >3% refer to the water erosion hazard table

Irrigation Water Quality
Maximum allowable EC <1500
Maximum allowable SAR <6

Water Management Practices
These soils are conditional for irrigation due to moderate and moderately slow permeability and a potential for salinity increase in the subsoil. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 9c
Irrigation Class: Conditional
Old Irrigation Group: 1A, 3D, 3A, 4A,

Slope: ≤ 3 percent [1/]

Drainage: moderately well and well drained

Surface texture: VFSL, FSL, SL, L, SIL, CL, SICL [2/]

Subsoil texture: L, SIL, CL, SICL

Surface intake rate for sprinkler irrigation: 0.5 - 0.7 in/hr

Limiting permeability within 40 inches: 0.6 - 2.0 in/hr

Profile characteristics: calcareous/medium and moderately fine textured materials

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.5 inches
4 feet	8.5 inches
5 feet	10.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 10 inches

Surface pH: 6.6 - 8.4

EC - (maximum within 40 inches in dS/m): < 4

SAR - (maximum within 40 inches): < 2

Typical Soils: Buse, Cherry [3/], Esmond, Havre [3/], Havrelon [3/], Korchea [3/], Lonna [4/], Rusklyn, Sakakawea, Sutley, Zell, Zahl

---

[1/] For slopes >3% refer to the water erosion hazard table
[2/] VFSL, FSL and SL surface textures have an intake rate for sprinkler irrigation of 1.0 in/hr.
[3/] May be stratified and have a lower permeability rates
[4/] Lonna soils have ECs of 0 - 8 dS/m

Irrigation Water Quality

Maximum allowable EC <1800
Maximum allowable SAR <6

Water Management Practices

These soils are conditional for irrigation due to moderate and moderately slow permeability and a potential for salinity increase in the subsoil. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production, may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 10c
Irrigation Class: Conditional
Old Irrigation Group: 2B

Slope: ≤ 3 percent [1/]

Drainage: moderately well and well drained

Surface texture: L, CL, SICL

Subsoil texture: CL, SICL, SIC, C (>35% clay)

Surface intake rate for sprinkler irrigation: 0.1 - 0.5 in/hr

Limiting permeability within 40 inches: 0.06 - 0.6 in/hr

Profile characteristics: moderately fine to fine texture material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.5 inches
4 feet	8.5 inches
5 feet	10.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 15 - 40

Surface pH: 6.1 - 7.8

EC - (maximum within 40 inches in dS/m): < 4

SAR - (maximum within 40 inches): < 4

Typical Soils: Bearpaw, Ethridge, Grail, Mondamin, Savage, Zeeland

_____

[1/]For slopes >3% refer to the water erosion hazard table.

Irrigation Water Quality
Maximum allowable EC <1000
Maximum allowable SAR <6

Water Management Practices
These soils are conditional for irrigation due to moderately slow and slow permeability and a potential for salinity increase in the subsoil. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low. An internal drain system may be required for continued irrigation.

These soils are somewhat marginal for irrigation and irrigation of extensive areas should be avoided. If soils in this irrigation group exceed 20% of an irrigated area, an experienced soil scientist should be consulted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 11c
Irrigation Class: Conditional
Old Irrigation Group: 2A

Slope: ≤ 3 percent [1/]

Drainage: moderately well and well drained

Surface texture: L, SIL, SICL

Subsoil texture: CL, SICL (>35% clay)

Surface intake rate for sprinkler irrigation: 0.1 - 0.7 in/hr

Limiting permeability within 40 inches: 0.06 - 0.2 in/hr

Profile characteristics: moderately fine and fine textured material that have a degraded natric horizon within 20 inches

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.0 inches
4 feet	8.0 inches
5 feet	10.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 20 - 30 inches

Surface pH: 5.6 - 7.3

EC - (maximum within 40 inches in dS/m): 2 - 8

SAR - (maximum within 40 inches): 5 - 15

Typical Soils: Aberdeen, Belfield, Cathay, Cresbard, Niobell

_____

[1/]For slopes >3% refer to the water erosion hazard table

Irrigation Water Quality
Maximum allowable EC <1500
Maximum allowable SAR <4

Water Management Practices
These soils are marginal for irrigation and irrigation of extensive areas should be avoided. Continued irrigation could potentially cause restricted water intake and permanent soil damage. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low. An internal drain system may be required for continued irrigation.

If soils in this irrigation group exceed 20% of an irrigated area, an experienced soil scientist should be consulted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 12c
Irrigation Class: Conditional
Old Irrigation Group: 3C

Slope: ≤ 3 percent [1/]

Drainage: well drained

Surface texture: L, SIL, SICL

Subsoil texture: L, SIL, SICL

Surface intake rate for sprinkler irrigation: 0.1 - 0.5 in/hr

Limiting permeability within 40 inches: 0.0 - 0.6 in/hr
depending on texture of soft weathered bedrock

Profile characteristics: medium and moderately fine textured materials moderately deep (20-40 inches) to soft weathered bedrock

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.5 inches
4 feet	.08 inches
5 feet	.08 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 - 20 inches

Surface pH: 6.1 - 7.8

EC - (maximum within 40 inches in dS/m): 2 - 8

SAR - (maximum within 40 inches): 0 - 4

Typical Soils: Amor, Chama [2/], Moreau [3/], Morton, Omio, Regent [3/]

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Chama soils are calcareous to the surface
[3/] Moreau and Regent soils permeability is 0.06 - 2.0 in/hr

Irrigation Water Quality
Maximum allowable EC <1800
Maximum allowable SAR <6

Water Management Practices
These soils are marginal for irrigation due to moderately deep (20-40 inches) bedrock and the potential for lateral seepage. Avoid irrigating extensive areas or where stratification is evident and seeps are present. Salinity monitoring should be done on a 3 to 5 year basis or more frequently if plant growth is restricted.

If soils in this irrigation group exceed 20% of an irrigated area, an experienced soil scientist should be consulted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 13c
Irrigation Class: Conditional
Old Irrigation Group: 7A, 3C

Slope: ≤ 3 percent [1/]

Drainage: well to somewhat excessively drained

Surface texture: LS, LFS, SL, FSL

Subsoil texture: LS, LFS, SL, FSL

Surface intake rate for sprinkler irrigation: 0.5 – 1.5 in/hr

Limiting permeability within 40 inches: 0.0 – 0.6 in/hr

Profile characteristics: coarse and moderately coarse textured material moderately deep (20-40 inches) to soft weather beds

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.5 inches
2 feet	3.0 inches
3 feet	3.5 inches
4 feet	.08 inches
5 feet	.08 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 10 – 20 inches

Surface pH: 6.1 – 7.8

EC – (maximum within 4 inches in dS/m): 0

SAR – (maximum within 40 inches): 0

Typical Soils: FSL Amor, Beisigl, Lefor [2/], Rhame, Tulser, Vebar

---

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Lefor soils have lower pHs

Irrigation Water Quality
Maximum allowable EC <1800
Maximum allowable SAR <6

Water Management Practices
These soils are marginal for irrigation due to moderately deep (20-40 inches) bedrock and the potential for lateral seepage. Avoid irrigating extensive areas or where stratification is evident and seeps are present. Salinity monitoring should be done on a 3 to 5 year basis or more frequently if plant growth is restricted.

If soils in this irrigation group exceed 20% of an irrigated area, an experienced soil scientist should be consulted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 14c
Irrigation Class: Conditional
Old Irrigation Group: 5A

Slope: ≤ 3 percent [1/]

Drainage: moderately well and well drained

Surface texture: LS, LFS, SL, FSL

Subsoil texture: L, CL, SICL

Surface intake rate for sprinkler irrigation: 0.5 - 1.5 in/hr

Limiting permeability within 40 inches: 0.2 - 0.6 in/hr

Profile characteristics: coarse textured material over medium and moderately fine textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.5 inches
2 feet	3.0 inches
3 feet	4.5 inches
4 feet	6.5 inches
5 feet	8.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: > 15 inches

Surface pH: 6.1 - 7.3

EC - (maximum within 40 inches in dS/m): 0 - 4

SAR - (maximum within 40 inches): < 2

Typical Soils: Dickey [2/], Flaxton, Krem [2/], Livona, Swenoda, Towner [2/], Virgelle [3/]

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Dickey, Krem, and Towner soils have lower AWC in the upper profile
[3/] May have lower permeability rates

Irrigation Water Quality
Maximum allowable EC <1800
Maximum allowable SAR <9

Water Management Practices
These soils are conditional for irrigation due to subsoil's moderately slow permeability and potential for salinity increase. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 15c
Irrigation Class: Conditional
Old Irrigation Group: 3B

Slope: ≤ 3 percent [1/]

Drainage: somewhat poorly and poorly drained [2/]

Surface texture: L, SIL, SICL, SIC, C

Subsoil texture: L, SIL, SICL, SIC, C

Surface intake rate for sprinkler irrigation: 0.1 - 0.7 in/hr

Limiting permeability within 40 inches: 0.2 - 0.6 in/hr

Profile characteristics: medium to fine textured materials

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	7.0 inches
4 feet	9.0 inches
5 feet	10.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 10 inches

Surface pH: 6.6 - 8.4

EC - (maximum within 40 inches in dS/m): < 6

SAR - (maximum within 40 inches): < 3

Typical Soils: Antler, Bearden, Cashel [3/], Galchutt [4/], Hamerly, Neche [4/], LaMoure, Perella [4/], Wheatville, Suomi [4/], Vallers, Wyard [4/]

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Seasonal water table for somewhat poorly drained soil is generally >1.5 feet and poorly drained is 0-1.5 feet
[3/] Galchutt soils have lower permeability rates
[4/] These soils have lime at deeper depths

Irrigation Water Quality
Maximum allowable EC <1500
Maximum allowable SAR <6

Water Management Practices
Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 16c
Irrigation Class: Conditional
Old Irrigation Group: 6C

Slope: ≤ 3 percent [1/]

Drainage: somewhat poorly and poorly drained [2/]

Surface texture: L, CL, SIL

Subsoil texture: L, CL

Surface intake rate for sprinkler irrigation: 0.1 - 0.5 in/hr

Limiting permeability within 40 inches: 0.6 - 2.0 in/hr in the upper part and > 6.0 in/hr in the lower part

Profile characteristics: Aeric and Typic Calciaquolls, medium and moderately fine textured material over sand and gravel

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	5.0 inches
4 feet	5.5 inches
5 feet	6.0 inches
	(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 10 inches

Surface pH: 7.4 - 8.4

EC - (maximum within 40 inches in dS/m): < 2

SAR - (maximum within 40 inches): 0

Typical Soils: Divide, Marysland, Vang variant drained

_____

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Seasonal water table for somewhat poorly drained is generally >1.5 feet and poorly drained is 0-1.5 feet

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <9

Water Management Practices
Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 17c
Irrigation Class: Conditional
Old Irrigation Group: 4B

Slope: ≤ 3 percent [1/]

Drainage: somewhat poorly and poorly drained [2/]

Surface texture: FSL, SIL, L

Subsoil texture: FSL, SIL, L

Surface intake rate for sprinkler irrigation: 0.5 - 1.0 in/hr

Limiting permeability within 40 inches: 0.6 - 2.0 in/hr

Profile characteristics: Aeric and Typic Calciaquolls, moderately coarse and medium textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.0 inches
4 feet	8.5 inches
5 feet	10.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 10 inches

Surface pH: 7.4 to 8.4

EC - (maximum within 40 inches in dS/m): < 6

SAR - (maximum within 40 inches): 0 - 1

Typical Soils: Bonsack, Borup, Fram, Glyndon

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Seasonal water table for somewhat poorly drained is generally >1.5 feet and poorly drained is 0-1.5 feet

Irrigation Water Quality
Maximum allowable EC <2250
Maximum allowable SAR <6

Water Management Practices
Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 18c
Irrigation Class: Conditional
Old Irrigation Group: 8B

Slope: ≤ 3 percent [1/]

Drainage: somewhat poorly and poorly drained [2/]

Surface texture: CoSL, LFS, LS, FS, S

Subsoil texture: LFS, LS, S, FS

Surface intake rate for sprinkler irrigation: 0.5 - 1.5 in/hr

Limiting permeability within 40 inches: 2.0 - 20.0 in/hr

Profile characteristics: coarse and moderately coarse textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.5 inches
2 feet	2.5 inches
3 feet	3.0 inches
4 feet	4.0 inches
5 feet	5.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 30 inches

Surface pH: 6.1 - 8.4

EC - (maximum within 40 inches in dS/m): 0 - 2

SAR - (maximum within 40 inches): 0 - 1

Typical Soils: Cormant, Fossum, Hamar, Karlsruhe, Minnewaukon Poppleton, Ulen, Wyrene [3/]

_____

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Seasonal water table for somewhat poorly drained is generally >1.5 feet and poorly drained is 0 - 1.5 feet
[3/] Underlain by sand/gravel at depths ≥ 20 inches

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <12

Water Management Practices
Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 19c
Irrigation Class: Conditional
Old Irrigation Group: 7B

Slope: ≤ 3 percent [1/]

Drainage: somewhat poorly and poorly drained [2/]

Surface texture: VFSL, FSL, SL

Subsoil texture: VFSL, FSL, SL

Surface intake rate for sprinkler irrigation: 0.5 - 1.25 in/hr

Limiting permeability within 40 inches: 2.0 - 6.0 in/hr

Profile characteristics: moderately coarse and medium textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.0 inches
2 feet	3.5 inches
3 feet	5.0 inches
4 feet	6.5 inches
5 feet	7.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: Calciaquolls 0 - 10 inches
Aquolls > 20 inches

Surface pH: 6.1 - 8.4

EC - (maximum within 40 inches in dS/m): 0 - 2

SAR - (maximum within 40 inches): 0 - 1

Typical Soils: Arveson, Tiffany, Tolna [3/], Wyndmere

[1/] For slopes >3% refer to the water erosion hazard table
[2/] Seasonal water table for somewhat poorly drained is generally >1.5 feet and poorly drained is 0 - 1.5 feet
[3/] Underlain by gravel at depths of 16 - 40 inches

Irrigation Water Quality
Maximum allowable EC <3000
Maximum allowable SAR <12

Water Management Practices
Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 20c
Irrigation Class: Conditional
Old Irrigation Group: 5B

Slope: ≤ 3 percent [1]/

Drainage: somewhat poorly and poorly drained [2]/

Surface texture: L, FSL, SL, LFS, LS

Subsoil texture: SL, SIL, L, CL

Surface intake rate for sprinkler irrigation: 0.5 - 1.5 in/hr

Limiting permeability within 40 inches: 0.2 - 2.0 in/hr

Profile characteristics: coarse and moderately coarse textured material over medium textured material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	1.5 inches
2 feet	3.0 inches
3 feet	4.5 inches
4 feet	6.5 inches
5 feet	8.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 -10

Surface pH: 7.4 - 8.4

EC - (maximum within 40 inches in dS/m): < 4

SAR - (maximum within 40 inches): < 2

Typical Soils: Espelie [3]/, Grimstad, Kratka [4]/, Rockwell

Include Arveson substratum, Wyndmere substratum and Wyrene substratum over medium or finer textured material.
[1]/For slopes >3% refer to the water erosion hazard table
[2]/Seasonal water table for somewhat poorly drained is generally >1.5 feet and poorly drained is 0 - 1.5 feet
[3]/Espelie soils are sandy over moderately fine to fine textured material
[4]/Depth to lime is > 20 inches and has lower pHs

Irrigation Water Quality
Maximum allowable EC <1800
Maximum allowable SAR <9

Water Management Practices
Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 21c
Irrigation Class: Conditional
Old Irrigation Group: 2B

Slope: ≤ 3 percent [1/]

Drainage: moderately well and well drained

Surface texture: SIC, C

Subsoil texture: SIC, C

Surface intake rate for sprinkler irrigation: 0.1 - 0.2 in/hr

Limiting permeability within 40 inches: 0.06 - 0.2 in/hr

Profile characteristics: fine texture material

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.5 inches
2 feet	4.5 inches
3 feet	6.0 inches
4 feet	8.0 inches
5 feet	10.0 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 20 inches

Surface pH: 7.3 - 8.4

EC - (maximum within 40 inches in dS/m): 1 - 4

SAR - (maximum within 40 inches): 0 - 1

Typical Soils: Hoffmanville [2/], Magnus, Marias, Nutley, Lawther [3/], Lohler [3/], Rolla, Scorio [2/], Sinai

---

[1/] For slopes >3% refer to the water erosion hazard table
[2/] May be stratified and have lower permeability rates
[3/] May have higher ECs and/or SARs

Irrigation Water Quality
Maximum allowable EC <1000
Maximum allowable SAR <6

Water Management Practices
These soils are conditional for irrigation due to moderately slow and slow permeability and a potential for salinity increase in the subsoil. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low. An internal drain system may be required for continued irrigation.

If soils in this irrigation group exceed 20% of an irrigated area, an experienced soil scientist should be consulted.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 22c
Irrigation Class: Conditional
Old Irrigation Group: 2C

Slope: ≤ 3 percent [1/]

Drainage: poorly drained and drained phases of poorly and very poorly drained

Surface texture: L, SIL, SICL, SIC, C

Subsoil texture: SIC, C

Surface intake rate for sprinkler irrigation: 0.1 - 0.4 in/hr

Limiting permeability within 40 inches: .06 - 0.2 in/hr

Profile characteristics: medium to fine textured material in the upper part and fine texture material lower part

Water Holding Capacity:

Depth	Average Cumulative Available Water Capacity
1 foot	2.0 inches
2 feet	4.0 inches
3 feet	6.0 inches
4 feet	7.5 inches
5 feet	9.5 inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 > 40 inches

Surface pH: 6.1 - 8.4

EC - (maximum within 40 inches in dS/m): < 4

SAR - (maximum within 40 inches): 0

Typical Soils: Dimmick, Dovray, Enloe, Fargo, Grano, Hegne Ludden, Parnell, Southam, Tonka [2/]

_____

[1/]For slopes >3% refer to the water erosion hazard table
[2/]May have loam or silt loam surface textures

Irrigation Water Quality
Maximum allowable EC <1000
Maximum allowable SAR <6

Water Management Practices
These soils are conditional for irrigation due to slow permeability, wetness and a potential for salinity increase. Irrigate only if adequate surface and subsurface drainage has been provided. Salinity of the root zone should be monitored on a 3 to 5 year basis or more frequently if plant growth is restricted. Water, additional to that used for crop production may be required for leaching. Leaching should be done in the fall or early spring when crop requirements for water are low. An internal drain system may be required for continued irrigation.

An irrigation scheduling system must be used (e.g., NDSU Extension Bulletin AE-792(revised), Commercial Irrigation Scheduling Service).

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 23n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1A

Slope: ≥ 6 percent slopes

Drainage: well to excessively drained

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: NA

Limiting permeability within 40 inches: NA

Profile characteristics: NA

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: variable

Surface pH: variable

EC - (maximum within 40 inches in dS/m): variable

SAR - (maximum within 40 inches): variable

Typical Soils: Buse Cabba, Flasher, Sioux

_____

[1/]These soils have very severe limitations. Irrigation generally not feasible because of relief, depth or root restrictive substrata. Avoid irrigation.

If soils in this irrigation group exceed 10% of an irrigated area, an experienced soil scientist should be consulted.

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 24n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1B

Slope: < 6 percent

Drainage: poorly to well drained

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: variable

Limiting permeability within 40 inches: 0.01 - 0.2 in/hr

Profile characteristics: Typic/Leptic Natriborolls or Natraquolls

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 - 30 inches

Surface pH: 6.1 - 8.4

EC - (maximum within 40 inches in dS/m): > 4

SAR - (maximum within 40 inches): > 13

Typical Soils: Cavour, Daglum, Harriet, Heil, Lakota, Nahon, Noonan

_____

[1/] These soils have very severe limitations. Irrigation generally not economically sound because of relief, sodicity, salinity, slow or very slow permeability, or root restrictive subsoil. Avoid irrigation.

If soils in this irrigation group exceed 10% of an irrigated area, an experienced soil scientist should be consulted.

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 25n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1C

Slope: < 6 percent

Drainage: poorly to well drained

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: variable

Limiting permeability within 40 inches: variable

Profile characteristics: moderate to strong salinity

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 – 10 inches

Surface pH: 6.6 – 8.4

EC – (maximum within 40 inches in dS/m): > 8

SAR – (maximum within 40 inches): 4 – 16

Typical Soils: Benz [2/], Easby, Ojata, Playmoor, Sham, Vallers saline, Sham, Vanda [2/]

_____

[1/]These soils have very severe limitations. Irrigation generally not economically sound because of salinity. Avoid irrigation.
[2/]Well drained

If soils in this irrigation group exceed 10% of an irrigated area, an experienced soil scientist should be consulted.

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 26n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1E

Slope: < 6

Drainage: well to excessively well drained

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: variable

Limiting permeability within 40 inches: 0.0 – 0.2 in/hr

Profile characteristics: shallow to very shallow (< 20 inches) to stratified weathered bedrock

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: 0 – 10

Surface pH: 6.1 – 8.4

EC – (maximum within 40 inches in dS/m): < 4

SAR – (maximum within 40 inches): < 2

Typical Soils: Cabba, Cohagen, Kloten, Dilts, Dupree, Flasher [2/], Werner

_____

[1/]These soils have very severe limitations. Irrigation generally not economically sound because of depth or root restrictive substrata. Avoid irrigation.
[2/]May have higher permeability rates

If soils in this irrigation group exceed 10% of an irrigated area, an experienced soil scientist should be consulted.

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 27n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1F

Slope: < 1

Drainage: very poorly drained

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: variable

Limiting permeability within 40 inches: variable

Profile characteristics: undrained phases of very poorly drained

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: NA

Surface pH: variable

EC - (maximum within 40 inches in dS/m): < 4

SAR - (maximum within 40 inches): < 2

Typical Soils: (undrained Fargo, Parnell, Ludden, Southam)...(peat and muck soils - Eramosh, Markey, Rifle, Seelyeville)

_____

[1/]These soils have very severe limitations. Irrigation generally not economically sound because of slow or very slow permeability or ponding. Avoid irrigation.

If soils in this irrigation group exceed 10% of an irrigated Area, an experienced soil scientist should be consulted.

NORTH DAKOTA IRRIGATION GUIDE

VERSION 1.4

Irrigation Group: 28n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1G

Slope: variable

Drainage: variable

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: variable

Limiting permeability within 40 inches: variable

Profile characteristics: frequently flooded

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: variable

Surface pH: variable

EC - (maximum within 40 inches in dS/m): variable

SAR - (maximum within 40 inches): variable

Typical Soils: Banks, Fairdale, Trembles, channeled phases

[1/] These soils have very severe limitations. Irrigation generally not economically sound because of frequent flooding. Avoid irrigation.

If soils in this irrigation group exceed 10% of an irrigated Area an experienced soil scientist should be consulted.

Irrigation Group: 29n [1/]
Irrigation Class: Nonirrigable
Old Irrigation Group: 1H

Slope: variable

Drainage: variable

Surface texture: variable

Subsoil texture: variable

Surface intake rate for sprinkler irrigation: variable

Limiting permeability within 40 inches: variable

Profile characteristics: extremely stony or bouldery surface

Water Holding Capacity: NA

Depth	Average Cumulative Available Water Capacity
1 foot	inches
2 feet	inches
3 feet	inches
4 feet	inches
5 feet	inches

(rounded to the nearest 0.5 inch; on-site values may vary)

Depth to lime: variable

Surface pH: variable

EC - (maximum within 40 inches in dS/m): variable

SAR - (maximum within 40 inches): variable

Typical Soils: extremely stony phases of Barnes, Buse, Williams, Zahl

_____

[1/]These soils have very severe limitations. Irrigation generally not economically sound because surface stones or boulders are so numerous that wheeled power equipment can operate only along selected routes. Avoid irrigation.

If soils in this irrigation group exceed 10% of an irrigated area an experienced soil scientist should be consulted.