

1780 Fall 1780

2.80 Mantun lensil: Top of section as MANTUN.  
 2.52 ss. --- Lentic. --- Base of MANTUN  
 5.2 M 1. --- Top of Section.  
 3.04 --- Top of section as MANTUN  
 --- Mantun lensil: ss.

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## SECTION 8225

280 m E., 1380 m N. of SW corner sec. 1, T. 20 N., R. 35 E., Garfield County, Montana.

<u>Unit</u>	<u>Elevation at Base (m)</u>		<u>Thickness (m)</u>
Tullock Formation:			
	8.9	Top of section	
	6.43	Siltstone, mudstone: in alternating yellow and orange interbeds, mudstone with limonitic concretionary ledges, typical of Lower Tullock.	1.48
6	5.8	Shale: silty, dark grey, fissile bentonitic, carbonaceous, with mollusk shells. Weathers brownish grey.	.62
5	5.35	Mudstone: chippy, medium greenish grey with limonite staining on joints.	.45
4	4.6	Shale: fissile, slightly silty, light yellow green, with horizontal roots, rhizomes, and rare leaves of <u>Nelumbium montanum</u> . Upper <u>0.45</u> m a fissile mudstone with roots. 3 mm lignite stringer at <u>4.7</u> m.	.75
3	4.54	Lignite	.06
Hell Creek Formation			
Paleosol sequence:			
	<u>4.5</u>	Siltstone: highly carbonaceous.	
		Clay: highly disrupted, silty, vertical and horizontal roots. 0.1 m above base become full of disseminated carbon, steel blue grey, with roots and rare clay blebs.	
	<u>4.2</u>	Mudstone with carbonaceous blebs.	
	<u>3.9</u>	Sandstone: very fine grained, silty at base, penetrated by roots, weathers light greenish yellow with orange limonite modules.	
	3.7		.84
	0	Mudstone: massive, greenish grey, limonite stained, with rare plant fragments, and manganese coatings on joints. Gradual transition to greenish yellow above 2.4. Upper 0.4 m with vertical roots and limonite yellow staining.	3.7
		Base of section †	



370 m E., 1210 m N. of SW Corner, Sec. 1, T. 20 N., R. 35 E., Garfield County, Montana.

Elevation = 8231 m

236° A2 - 0° dip from initiation of Morales I section.

Distance + 30 paces to Morales I.

<u>Elevation of base of unit (m)</u>	<u>Unit</u>	<u>Thickness (m)</u>
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Tullock Formation:

4.2	Siltstone, Mudstone: in alternating yellow and orange interbeds, mudstone with limonitic concretionary ledges, typical of Lower Tullock.	
4.05	Shale: fissile, carbonaceous	.15
2.6	Sandstone: fine-grained, clayey, laminated, subangular, brown-grey, with carbon on laminae, with limonitic yellow weathered patches in lower half. Becoming more and more silty above 3.6 m.	1.45

Inferred channel filling unit of carbonaceous shales, mudstones, and rare sandstone.

<u>2.42</u>	Siltstone: fissile, dark brown grey, becoming a shale upward.	
<u>1.7</u>	Shale: fissile, dark grey, with shells above 2.05.	
<u>1.51</u>	Mudstone: fissile, dark brown grey.	
<u>1.15</u>	Siltstone: fissile, dark brownish to yellowish grey, with plant fragments.	
<u>0.25</u>	Shale: fissile, dark brown grey, becoming a fissile mudstone upward. Weathers rusty yellow above <u>0.6</u> and with a 0.01 in clay-ironstone concretion layer at basal contact.	
<u>-0.02</u>	Sandstone: fine to medium grained, massive, dirty brown, rusty at top.	
	<u>0.08</u> shell bed.	
-0.27	Shale: fissile, brownish black, carbonaceous, with plant fragments. Basal 3 cm with lignite splits, but not a lignite.	2.87

Hell Creek Formation:

-0.3	Mudstone: massive, olive drab, with rare plant fragments, as Unit 1 of 8231.	.03
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Base of Section



## SECTION 8231

Morales I Hill

370 m E., 1260 m N. of SW Corner, Sec. 1, T. 20 N., R. 35 E., Garfield County, Montana.

<u>Unit</u>			<u>Thickness</u>
3	3.2	Top of Section	
	2.65	Shale: fissile, dark brown grey, carbonaceous	.55
	2.01	Shale: fissile, yellow brown, carbonaceous, with poor plant fragments.	.64
2		Sandstone: very fine grained, clayey, friable, subangular, brownish grey with carbon stains and blebs, some limonite, apparent down cutting relations. Some carbonaceous laminae in top decimeter. Large punky carbon blebs.	
	1.38	<u>1.8</u> shell beds with carbon masses, inferred to be roots or logs.	.63
1	0	Mudstone: massive, olive drab, with rare plant fragments.	1.38

Base of section on flat in front of hill.





## SECTION 8210

Section runs from base of Mantua lentil through lignitic base of Fort Union Formation and uppermost Lance Formation.

Polecat Bench N. Side 180 m NW of Mantua Quarry, center e. line, NW, NE, SW  $\frac{1}{4}$  sec 31, T7N, R98W, Park County, Wyoming. Old locality 7839. Garland 7 $\frac{1}{2}$ ' Quad.

Pollen and Iridium sampling at even 10 cm intervals. Sampling with steel tools. Dug 2 trenches about 1 foot apart through weathered zone. No wedding rings. Final digging done with a ceramic spatula.

Section starts about 1.8 m below the base of a lignite marking the bottom of the Fort Union Formation and ends in a sandstone bed of the Mantua lentil of the Fort Union Formation.

## UNIT

Elevation at Base Thickness (m)

## Fort Union Formation:

2.6	Top of section as measured in Mantua lentil.	
	Mantua Lentil: sandstone: very fine grained, subangular, dirty, cross-bedded, ledge-forming, color 5Y 7/2, lower contact irregular. Base	
2.52	of Mantua lentil.	.08
2.5	Shale: thin, lignitic just below contact	
	Mudstone: Parallel bedded, 5Y 6/1, with stringers of lignite. Interbedded segment of thin wavy	
2.01	lignite stringers and 1 to 4 cm beds of mudstone.	.49
1.92	Lignite	.09
1.86	Clay interbed 5Y 6/1	.06
1.79	Lignite: Marks base of Fort Union Formation	.07

## Lance Formation:

	Underclay, 5Y 6/1, with roots, comminuted plant matter and contorted carbonaceous laminae.	
1.62	<u>1.7 - 1.79</u> above base. Underclay 5Y 6/1, with limonite stains on joints, and root impressions.	.17
1.42	Mudstone: with gypsum on joints. Stringers of coal 1-2 mm thick above 1.56.	.2



SECTION 8210  
continued

UNIT

Lance Formation		Thickness
1.37	Mudstone: more massive (than at 1.33), 10YR 5/2, with plant fragments	.05
1.33	Mudstone: fissile, with comminuted plant remains	.04
1.23	Shale: fissile, silty, 10YR 7/4, with scrappy plant remains, limonite staining	.1
1.19	Siltstone: fissile, carbonaceous, 10YR 6/2, base of fine-grained and lignitic unit	.04
0.75	Sandstone: with thin wavy stringers of fissile siltstone and some stringers of brownish mudstone with plant fragments. Upper 10 cm becomes increasingly brownish and carbonaceous. 0.84 - 0.86 Prominent brownish mudstone partings with platanoid and cercidiphylloid leaf impressions.	.46
0.49	Sandstone: very fine grained subangular arkosic, 10YR 6/4, some outlining of cross beds with carbonaceous material	.26
0.41	Siltstone lens: fissile, with some clay	.08
0.31	Sandstone: as at 0.49, with layer of carbonaceous material, irregular basal contact. This is base of a sandstone lens extending upward to above 1 m	.1
0.22	Mudstone: fissile, chippy, 5Y 5/2 with plant fragments	.09
0.18	Mudstone: grading upward to dark grey fissile shale through this interval	.04
0.16	Mudstone: friable 5GY 6/1	.02
0.02	Sandstone; very fine grained, massive, 5Y 7/2 with limonite mottling and plant fragments	.14
0	Mudstone: massive, 10YR 6/2	.02
Base of Section		



## SECTION 8211

Road to Dumbell Hill at top of escarpment just where road comes off Polecat Bench.

1130 m east of SW Corner, 340 m north of SE Corner of sec 31 T 57N, R98W, Park County, Wyoming. Deaver Reservoir 7 $\frac{1}{2}$ ' Quad.

## UNIT

Fort Union Formation:	Thickness
5.2      Top of Section	
Mantua lentil: sandstone; as in Sec. 8210 at 2.52 m, representing the lateral extension of the Mantua lentil. Unit is calcareously cemented and ledge forming with a 0.4 m interbed of carbonaceous shale lying 1 m above its basal contact.	2.16
3.04	
Shale: carbonaceous, 5YR 4/1 with limonite staining and plant fragments, becomes papery above 2.68. <u>2.95</u> siltstone, cross-laminated, with vertical roots, otherwise as below. <u>2.87</u> shale: becomes platy with plant fragments <u>2.83</u> shale: gypsiferous, 5GY 6/1 <u>2.74</u> shale: chippy, silty, with poor leaf fragments.	1.06
2.46	
2.42      Siltstone: about 2.5 cm thick	.04
2.23	
Clay: massive, 10YR 6/2, with vertical and horizontal roots.	.19
2.15	
Lignite: blocky, black, top 1 cm brown and gypsiferous. Basal contact of Fort Union Formation.	.08
Lance Formation:	
2.11      Clay: massive, carbonaceous, 10YR 5/2	.04
2.10      Lignite stringer	.01
Clay: carbonaceous, 5Y 3/2, slickensided, limonite stained, with root impressions. Interpreted as an underclay of lignite at 2.10.	
1.8 <u>1.99 - 1.95</u> Band of unctuous dark grey (5Y 2/2) clay.	.11
Mudstone: fissile, 5Y 6/2 with root casts, carbonaceous material, and limonite joint stains. Plant fragments and roots more common upward.	
1.25 <u>1.45</u> mudstone: chippy	.74



SECTION 8211  
continued

UNIT

Lance Formation		Thickness
1.18	Siltstone: limonite staining on joints, carbonaceous fragments, root casts.	.07
0.88	Lens of sandstone and siltstone. Sandstone: very fine grained, silty, with vertical root casts, grading downward below <u>1.0 m</u> into a siltstone, 5Y 7/2, with brown laminae and vertical root casts. <u>1.1 - 1.2</u> color 5Y 6/4	.3
0.8	Siltstone; fissile, 5Y 5/6, with root casts	.08
0.75	Clay: silty, fissile	.05
0.69	Mudstone: fissile, carbonaceous, 5Y 6/2	.06
0.46	Sandstone: in small channel base dipping N, very fine-grained subrounded, disturbed bedding, clayey, with limonite staining at base, and wood fragments.	.13
0.3	Siltstone: fissile, becomes massive, some gypsum	.16
0.23	Shale: becomes massive, limonite staining still present	.07
0.12	Shale: fissile, 5Y 6/2	.11
0.08	Shale: grading upwards to siltstone, 5Y 5/2 with root casts, some limonite staining.	.04
0	Shale: fissile, 5Y 6/2 with rare vertical root casts.	.08
Base of section		





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2.01	Mudstone: Parallel bedded, 5Y 6/1, with stringers of lignite. Interbedded segment of thin wavy lignite stringers and 1 to 4 cm beds of mudstone.	.49
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continued

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



SECTION 8211  
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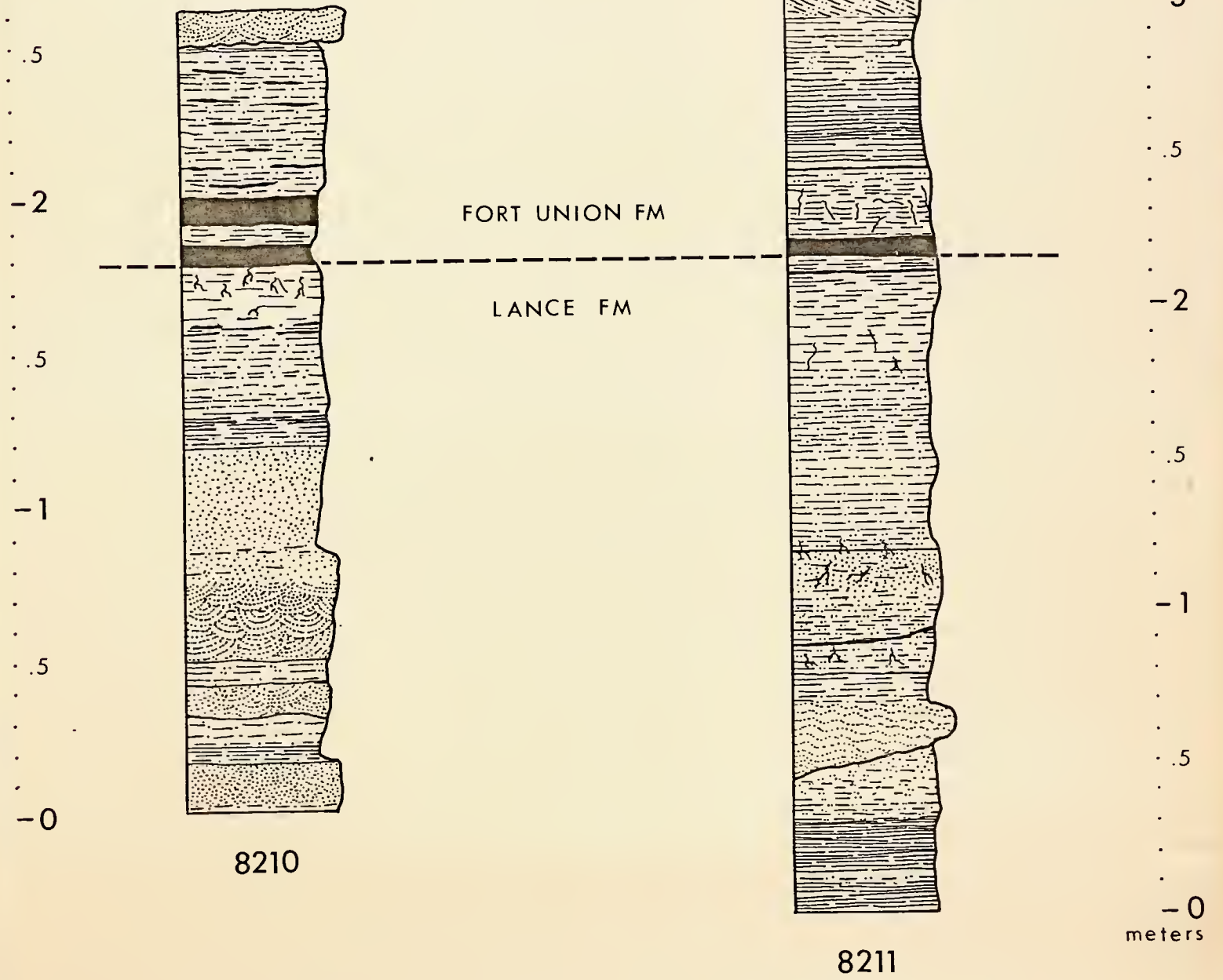
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0	Shale: fissile, 5Y 6/2 with rare vertical root casts.	.08
Base of section		




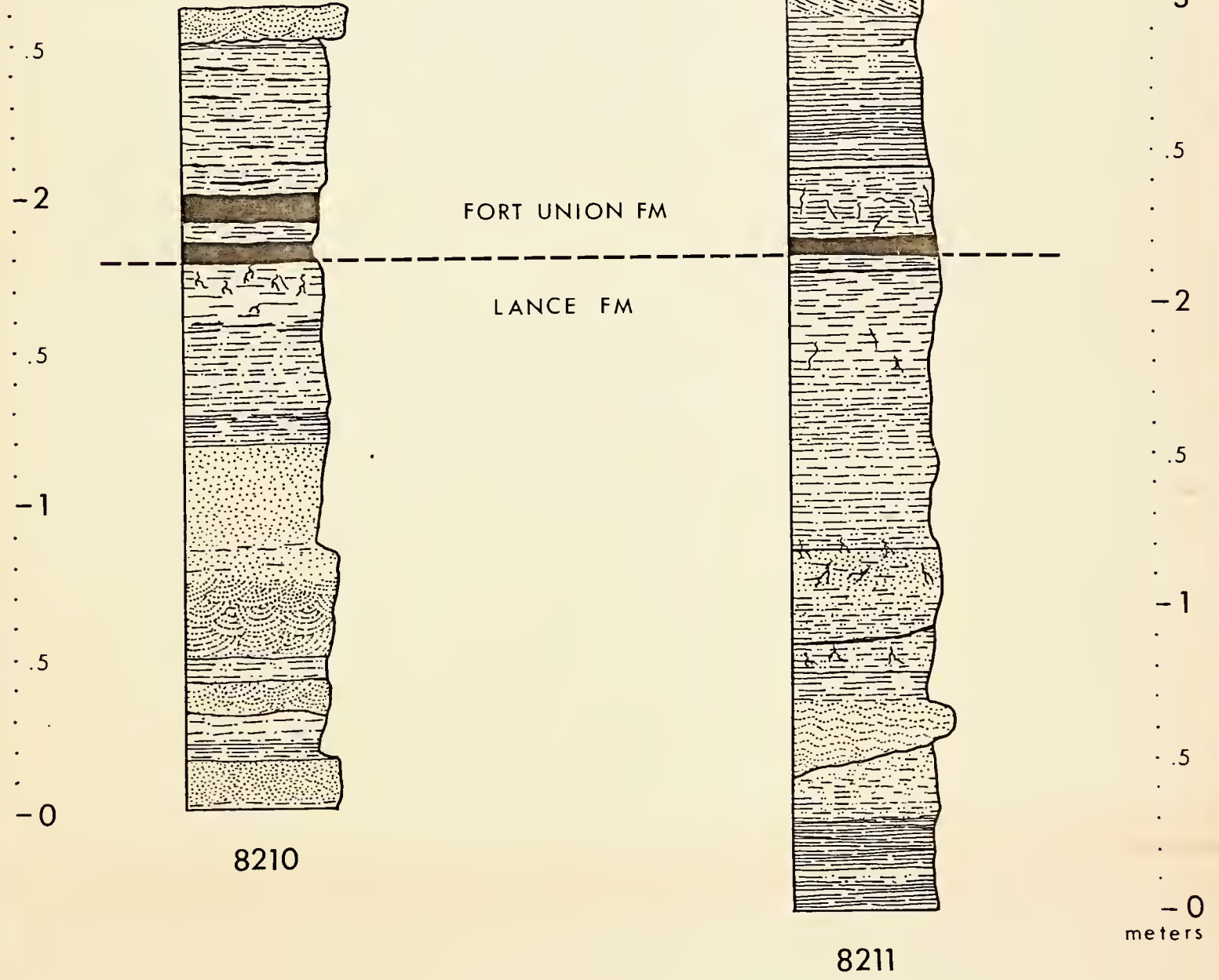


-  lignite
-  shale
-  clay
-  mudstone
-  siltstone
-  sandstone





-  lignite
-  shale
-  clay
-  mudstone
-  siltstone
-  sandstone





9  
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1382 Field Notes

**Spread** •

No. 153L

HASTINGS, MN  
LOS ANGELES-CHICAGO-LOGAN, OH  
MCGREGOR, TX-LOCUST GROVE, GA  
U.S.A.

