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# APPENDICES

## A - C



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APPENDIX A  
North American Glacial Episodes and General Geologic Time Scale

Geologic Period	Geologic Epoch	Sub-Division	O Isotope Stage <sup>2</sup>	Years (BP)	
<b>QUATERNARY</b>	<b>Holocene</b>		(1)	0 to 10-12 ka*	
	<i>Late Pleistocene</i>	Late Wisconsin	(2)	10-12 to 28 ka	
		Middle Wisconsin	(3, 4)	28 to 71 ka	
		Early Wisconsin	(5a - 5d)	71 to 115 ka	
		<i>Late Sangamon</i>			
		Sangamon	(5e)	115 to 128 ka	
	<b>Pleistocene</b>	<i>Middle Pleistocene</i>	Late - Mid Pleistocene ( <i>Illinoian</i> )	(6 - 8)	128 to 300 ka
			Middle - Mid Pleistocene	(9 - 15)	300 to 620 ka
		<i>Early Pleistocene</i>	Early - Mid Pleistocene	(16 - 19)	620 to 770 ka
					770 ka to 1.64 Ma**
<b>TERTIARY</b>	<b>Pliocene</b>			1.64 to 5.2 Ma	
	<b>Miocene</b>			5.2 to 23.3 Ma	
	<b>Oligocene</b>			23.3 to 35.4 Ma	
	<b>Eocene</b>			35.4 to 56.5 Ma	
	<b>Paleocene</b>			56.5 to 65.0 Ma	
<b>CRETACEOUS</b>	<i>Late Cretaceous</i>			65.0 to 97.0 Ma	
	<i>Early Cretaceous</i>			97.0 to 145.6 Ma	
<b>JURASSIC</b>				145.6 to 208.8 Ma	
<b>TRIASSIC</b>				208.8 to ≈ 243.0 Ma	
<b>PERMIAN</b>				≈ 243.0 to 290.0 Ma	
<b>PENNSYLVANIAN</b>				290.0 Ma to 322.8 Ma	
<b>MISSISSIPPIAN</b>				322.8 to 362.5 Ma	
<b>DEVONIAN</b>				362.5 to 408.5 Ma	
<b>SILURIAN</b>				408.5 to 439.0 Ma	
<b>ORDOVICIAN</b>				439.0 to 510.0 Ma	
<b>CAMBRIAN</b>				510.0 to ≈ 570.0 Ma	
<b>PRECAMBRIAN</b>				> ≈ 570.0 Ma	

\* ka = x 1,000; \*\* Ma = x 1,000,000

≈ = "approximately"

<sup>1</sup> Modified from Morrison, 1991; Sibrava, et al., 1986; and Harland, et al., 1990.

<sup>2</sup> Oxygen isotope.

## APPENDIX B Water Rights on Cokeville Meadows NWR

Former Owner	Tract	Right No.	Priority	Source	Name	Use	(cfs)	(gpm)
Richard Cornia	15,a	permit 12453	6/1/14	Antelope Creek	Ellen Reservoir	i	1.22	
Richard Cornia	15,a	permit 98366	9/7/93	Groundwater	Beckwith #1	i		
Richard Cornia	15,a	permit 113469	12/17/98	Groundwater	Beckwith #1 Enl	i	0	0
Richard Cornia	15,a	U.W. 15161	8/14/72	Groundwater	Corina Well #1	s,c		25
Richard Cornia	15,a	U.W. 42138	4/8/77	Groundwater	Corina Well #3	i		
Richard Cornia	15,a	permit 113469	12/17/98	Groundwater	Beckwith #1 Enl	i		
Richard Cornia	15,a	permit 9120	6/9/09	Smith's Fork	Covey Canal	l,d		
Richard Cornia	15,a	permit 9120	6/9/09	Smith's Fork	Covey Canal	i	0.29	
Richard Cornia	15,a	permit 9120	6/9/09	Smith's Fork	Covey Canal	i	0.69	
Leo Cornia	41,a	U.W. 15162	8/14/72	Groundwater	Corina Well #2	i		
Leo Cornia	41,a	permit 295E	5/31/1897	Smith's Fork	Mau Canal Enl	s,d	7.34	
Leo Cornia	41,a	permit 9120	6/9/09	Smith's Fork	Covey Canal	l,d	2.2	
Buckley	20a,30		4/18/25	Antelope Creek	Tanner Supply Ditch	i	0.38	
Buckley	20a,30	U.W. 74218	11/9/84	Groundwater	Buckley Well #4 Enl	i		
Buckley	20a,30	U.W. 59625	7/1/82	Groundwater	Buckley Well #3	d,s		25
Buckley	20a,30	U.W. 60689	2/8/82	Groundwater	Buckley Well #4	i		
Buckley	20a,30	permit 9120 proof 23297	6/9/09	Smith's Fork	Covey Canal	i	0.1	
Buckley	20a,30	permit 9120 proof 23412	6/9/09	Smith's Fork	Covey Canal	i	0.88	
Buckley	20a,30	permit 9120	6/9/09	Smith's Fork	Covey Canal	i	0.75	
Buckley	20a,30	permit 9120 proof 20756	6/9/09	Smith's Fork	Covey Canal	i	4.81	
Buckley	20a,30	permit 9120 proof 15155	6/9/09	Smith's Fork	Covey Canal	i	1.14	
Thornock	19,a-c	terr 8617	5/31/1878	Bear River	BQ-Dam East Ditch	i	8.93	
Thornock	19,a-c	terr 8619	12/31/1879	Bear River	Pixley Dam	i	2.3	
Thornock	19,a-c	terr 8621	12/31/1880	Bear River	Pixley Irrigation Ditch	i	0.43	
Thornock	19,a-c	terr 8634	12/31/1881	Bear River	Pixley Irrigation Ditch	i	2.37	
Thornock	19,a-c	USA does not hold water right but uses shares managed by water-right owner	5/31/1878	Beckwith Quinn Canal Co	BQ-Dam East			
Thornock	19,a-c	USA does not hold water right but uses shares managed by water-right owner	5/31/1878	Beckwith Quinn Canal Co	BQ-Dam East			
Thornock	19,a-c	U.W. 275	7/27/59	Groundwater	Thornock Bros #1	i		
Thornock	19,a-c	U.W. 57459	4/14/81	Groundwater	Thornock Well #3	l,s		
Thornock	19,a-c	U.W. 73966	6/9/82	Groundwater	Thornock Well #3 Enl			
Thornock	19,a-c	permit 3264, Proof 8722	6/12/01	McFarland Ditch	Ditch	i	1.14	
Thornock	19,a-c	terr 8833	12/31/1881	Spring Creek	North Lake Ditch	i	0.29	
Thornock	19,a-c	permit 9120 Proof 16241	6/9/09	Smith's Fork	Covey Canal	i	5.49	
Thornock	19,a-c	permit 9120 Proof 23412	6/9/09	Smith's Fork	Covey Canal	i	0.08	
Thornock	19,a-c	terr 8918	12/18/08	Sucker Springs		s,d		
Bartlett	44a	terr	5/31/1878	Bear River	BQ Dam East Ditch	i	0.68	
Bartlett	44a	terr	12/31/1881	Bear River	Pixley Ditch	i	0.29	
Bartlett	44a	U.W. 41237	7/20/77	Groundwater	Bartek #1 Well	i		
Bartlett	44a	permit 9120	6/9/09	Smith's Fork	Covey Canal	l,d	4.97	
Etcheverry Sheep Co.		permit 1761E	8/3/07	Bear River	Pixley Ditch Enl	i	0.08	
Etcheverry Sheep Co.		terr	12/31/1880	Bear River	Pixley Irrigation Ditch	i	2.35	
Etcheverry Sheep Co.		terr	12/31/1881	Bear River	Pixley Irrigation Ditch	i	0.58	
Etcheverry Sheep Co.		terr	12/31/1880	Bear River	Pixley Irrigation Ditch	i	11	
Etcheverry Sheep Co.		U.W. 308	7/24/59	Groundwater	Etcheverry Well #1	i		
Etcheverry Sheep Co.		permit 295E	5/31/1887	Smith's Fork	Mau Canal Enl	s,d		
Etcheverry Sheep Co.		USA does not hold water right but uses shares managed by water-right owner		Woodruff Narrows Reservoir	Woodruff Narrows Ditch			
Dimond	10,a	permit 2066E	3/8/09	Pine Creek	Mau Canal Enl	i		
Dimond	10,a	permit 9120	6/9/09	Smith's Fork	Covey Canal	l,d		
Dimond	10,a	permit 2065E	3/6/09	Smith's Fork	Mau Canal Enl	l,d		

## APPENDIX C

Documentation of construction projects on Cokeville Meadows NWR 2003-2009.

### Cokeville Meadows National Wildlife Refuge Improvements by Year

K. Kirk

9/15/09

#### **Etcheverry Project (2003,04,05)**

The first improvements to the Refuge occurred on the Etcheverry Tract(13). During these three years work was done to improve the irrigation system and make dikes more accessible to Refuge staff. 3.5 miles of existing dike was improved and 28 board-stop structures were installed to more efficiently move water out of the Pixley ditch and to move water through a cross dike that divides the unit. A structure was added to let water flow back out to the river in high water years to avoid overtopping the dike that divides the unit. Two crossings were replaced and one crossing was added to better aid travel throughout the unit for Refuge employees and to try to discourage cattle from walking through the ditch.



#### **Thornock and South Bartlett Project (2005,06,07)**

The Thornock(19) and South Bartlett(44a) tract improvements began in 2005. Over the next 3 years a little over 2 miles of existing dike was improved within the two units and 17 board-stop structures were added or replaced to better irrigate the lands and create seasonal wetlands for migrating and nesting waterfowl, waterbirds, and shorebirds.



## APPENDIX C Continued

### **Thornock Pivot (2006)**

The Refuge was able to replace a center pivot irrigation system that was purchased with the land sale of tract 19. It is placed on a 1200 gpm ground water well. This land is currently used to grow alfalfa. Irrigation starts in late May to early June and lasts until late August.



### **North Cornia or Netherly Slough Pullout (2006 - 2008)**

A visitor contact area was added in 2006 on the North Cornia tract (41). An informational kiosk and large parking lot were constructed as well as a small paved walking trail and benches overlooking the slough.

In 2008 improvements were done to the dike along the south side of the Mau Canal as it runs through tract 41 and board-stop structures were added to let water flow through the wetland unit. Two structures were also added to the north side of the Mau Canal for private use. The length of the ditch/levee that was improved is approximately 1/3 of a mile. Two 15 inch structures were added to fill and drain the wetland. Two 46 inch crossings were added in the ditch and two 24 inch structures were added to irrigate the private land to the north. These improvements greatly increased the visibility of wildlife for the contact station.



## APPENDIX C

Continued

### Thornock Project Continued 2009

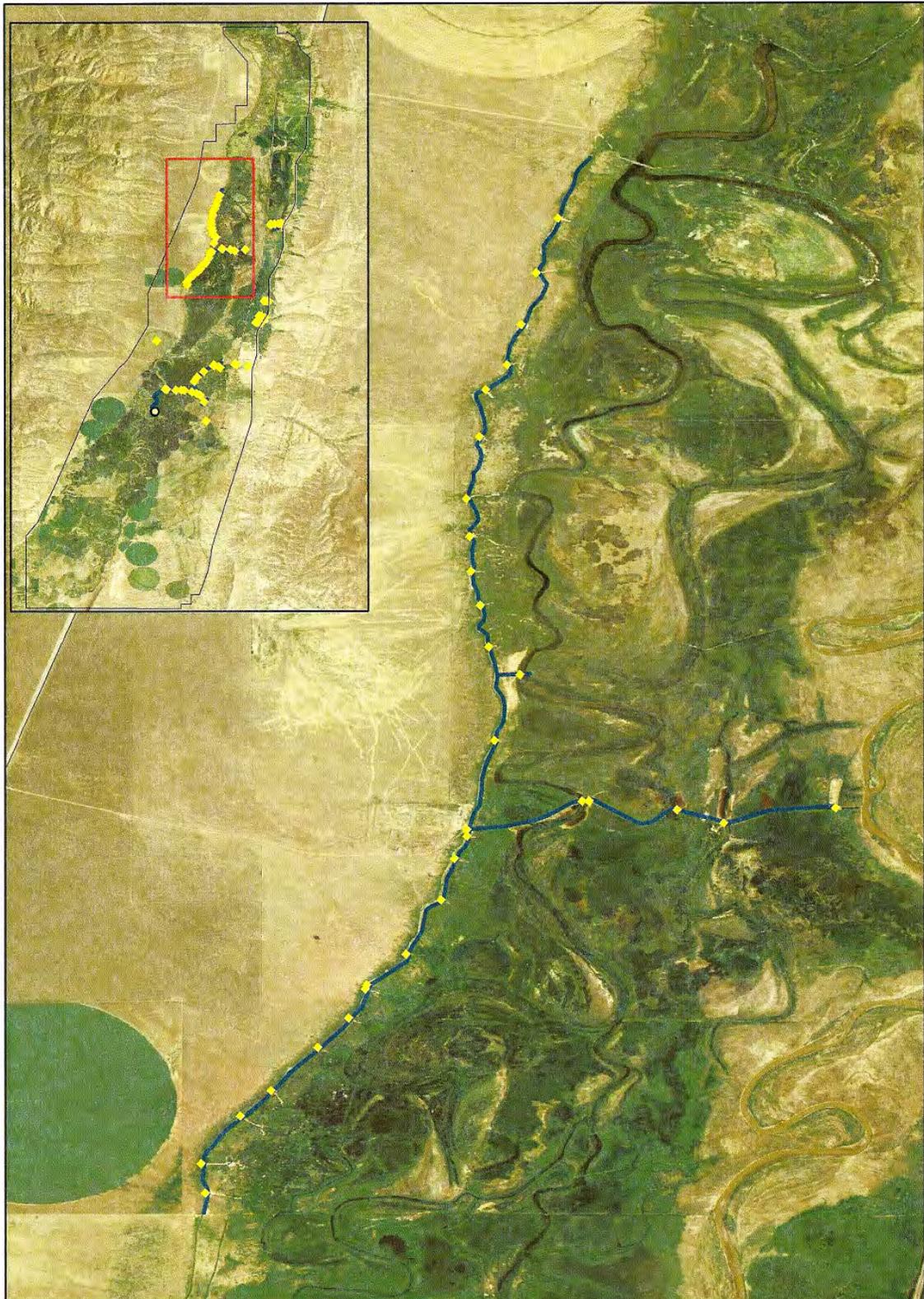
This year the Refuge improved  $\frac{3}{4}$  of a mile of the Beckwith and Quinn (BQ) dike that runs along the Bear River on the Thornock tract (19). The new dike has a 12 foot width at the top and no structures were added to it. Adjacent to the south end of the work on the Refuge an additional dike that runs to the east was connected. Two 36 inch structures and one open pipe (crossing) was added to that dike to help back water up onto private land before it flows onto the Refuge. Plans to continue working south on private land are slated for 2010.



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APPENDIX C  
Continued

Cokeville Meadows Improvements Etcheverry Tract 2003, 2004, 2005



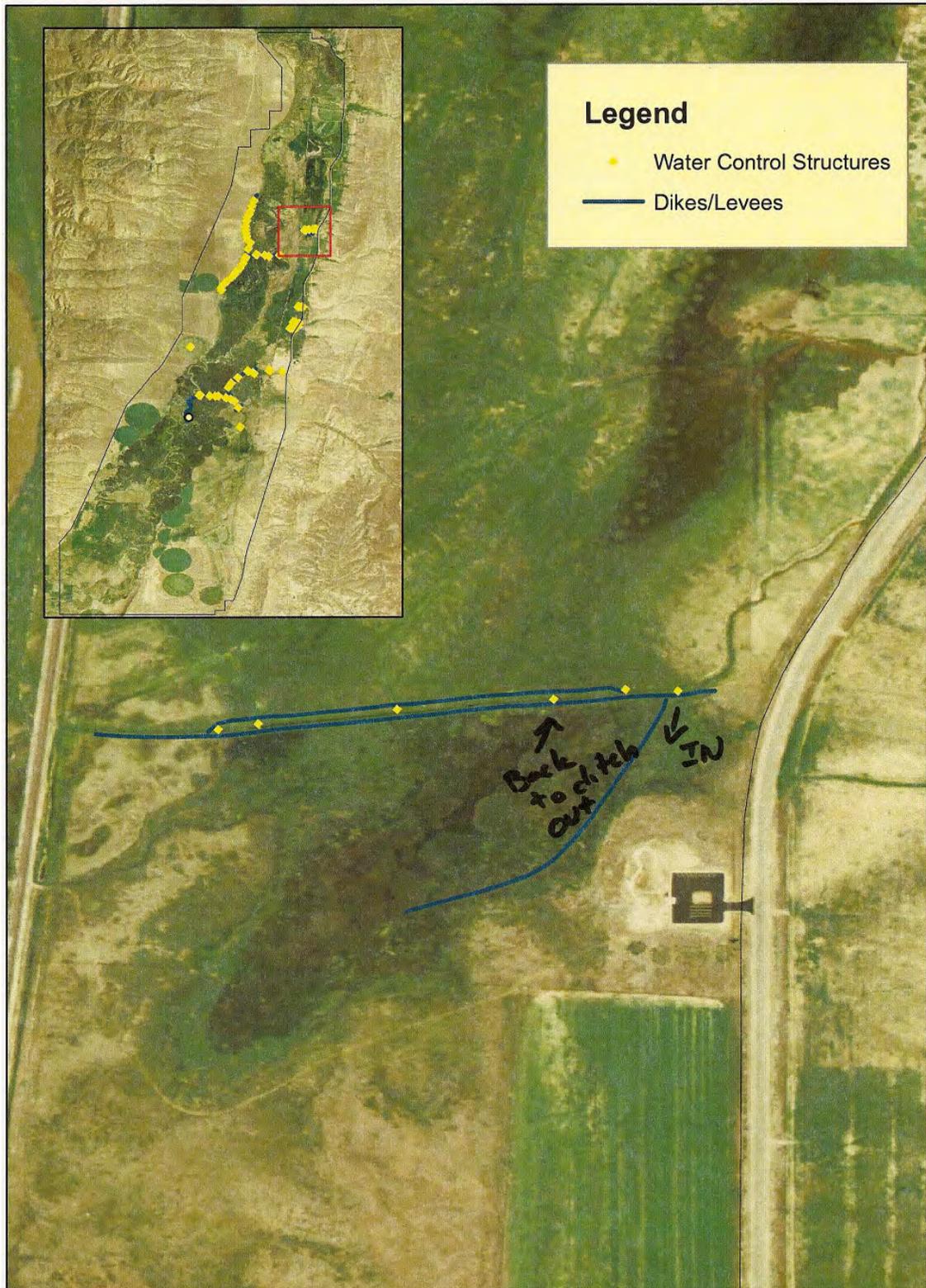
### APPENDIX C Continued

#### Cokeville Meadows Improvements Bartlett Tract Installed structures on existing ditches 2009



### APPENDIX C Continued

#### Cokeville Meadows Improvements North Cornia Tract Parking lot and Trail 2006, Wetland and Ditch Creation/Restoration 2008



### APPENDIX C Continued

#### Cokeville Meadows Improvements Thornock & S. Bartlett 2005, 2006, 2007 and 2009

