Subject: **Northeast Wyoming River Basins Plan**
Irrigated Crops
Task 2A

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INTRODUCTION

Irrigated agriculture represents the greatest consumption of water within the boundaries of the Northeast Wyoming River Basins planning area. An accurate estimate of existing irrigation water use is therefore central to a comprehensive water use inventory. Estimates of water use by irrigated agriculture can generally be divided into the following three components:

1. Quantity of irrigated lands
2. Types of crops grown and geographic distribution
3. Depth of water consumed by the crops

Appropriate estimates of each of these three components are essential to reasonable estimates of water use by irrigated agriculture.

This memorandum summarizes the methodology used to determine the type and geographic distribution of crops grown on irrigated lands in the basin. The methodology used to map the extent and classification of the irrigated land is summarized in the memorandum "Irrigated Lands Mapping and Water Rights Data" (HKM, 2002). The methodology used to determine the amount of water consumed by irrigated agriculture is summarized in the memorandum "Agricultural Water Use" (HKM, 2002).

The 1972 Water Planning Program report "Water and Related Land Resources of Northeastern Wyoming" summarized the crop distribution for the study area encompassing the Tongue River, Powder River, Little Missouri River, Belle Fourche River, and Cheyenne River (SEO, 1972). Although the crop acreage is not subdivided by drainage, the total acreage and percentages are helpful for the purpose of comparison to the recent estimates. The total crop acreage from the 1972 water plan is summarized in Table 1.

TABLE 1
SUMMARY OF CROP DISTRIBUTION
1972 WATER PLAN REPORT

CROP	ACRES	DISTRIBUTION (% of Total)	DISTRIBUTION (% of Active Irrigated Acres)
Alfalfa	62,580	39.0	45.7
Native Hay	9,465	5.9	6.9
Other Hay	11,820	7.4	8.7
Pasture	41,055	25.6	30.0
Barley	2,690	1.7	2.0
Oats	7,600	4.7	5.6
Sugar Beets	415	0.3	0.3
Corn Silage	1,100	0.6	0.8
Idle	23,860	14.8	NA
TOTAL	160,585 (136, 725 active)	100.0	100.0

As shown in the table above, forage crops (alfalfa, native hay, other hay, and pasture) dominated the crop distribution for Northeastern Wyoming in the early 1970s accounting for approximately 91 percent of the total crop acreage under active irrigation (124,920 acres out 136,725 total acres). The percentage of alfalfa and grass was evenly split.

COUNTY AGRICULTURAL STATISTICS

HKM obtained crop production records from the National Agricultural Statistics Service of the USDA (http://www.nass.usda.gov/) as another source of information regarding crop distributions. This information, summarized by county, is helpful as a crosscheck against the more site-specific information developed for this project. The data was collected for the years 1970 through 1999 consistent with the study period for the hydrology task described in the "Surface Water Hydrology" memorandum (HKM, 2002). The national agricultural statistics data was verified against the data from the Wyoming Agricultural Statistics Service for the years 1998 and 1999 (http://www.nass.usda.gov/wy/). No inconsistencies were found. The available data for 1970 – 1999 was used to calculate the average harvested acres and percentages of irrigated crops for the counties encompassed by the planning area. This information is summarized in Table 2.

TABLE 2
SUMMARY OF CROP DISTRIBUTION
1970-1999 AGRICULTURAL STATISTICS

	ALFALFA		GRASS HAY		GRAIN		CORN		BEANS		TOTAL	
COUNTY	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Campbell	2,093	51	1,583	38	328	8	127	3	0	0	4,130	100
Converse	23,450	63	9,160	25	2,873	8	1,142	3	520	1	37,146	100
Crook	4,883	56	2,945	34	424	5	404	5	0	0	8,656	100
Weston	2,112	55	836	22	205	5	696	18	0	0	3,848	100
Niobrara	7,323	52	2,910	21	2,038	15	1,662	12	3	0	13,936	100
TOTAL	39,861	59	17,434	26	5,868	8	4,031	6	523	1	67,716	100

Similar to the results of the 1972 water plan, forage crops (alfalfa and grass hay) were still the dominant crops in the basin from 1970 through 1999, accounting for approximately 85 percent of the total crop acreage. However, in contrast to the 1972 water plan, the distribution between alfalfa and grass crops is now more heavily weighted towards alfalfa (59 percent vs. 26 percent).

AERIAL PHOTOGRAPHY INTERPRETATIONS

HKM obtained 1994/1996 National Aerial Photography Program (NAPP) black and white imagery as the primary basis for the mapping of irrigated lands. A total of approximately 1,250 images were acquired for the planning area. Mapping was performed by viewing the imagery 3-dimensionally, using a Lietz MS-27 three power track stereoscope.

In addition to mapping the irrigated lands and irrigation systems, HKM also utilized the stereo aerial photography as a primary basis for determining the types of crops grown in the various portions of the planning area. Consistent with the 1972 water plan and the agricultural statistics, the two primary crops grown in the basin are still alfalfa and grass (grass hay or pasture grass). HKM's certified photogrammetrist, made a visual assessment of the condition of the fields as well as the foliage density as a primary means of distinguishing between alfalfa and grass hay or pasture. Row crops such as grain crops or corn were more easily distinguished visually although they are of much more limited extent.

Each of the approximately 1800 parcels of irrigated land ("polygons") in the planning area was assigned a primary crop based on the visual assessment (either alfalfa or grass). Grain and corn crops were typically found within polygons where alfalfa was the dominant crop. Because these crops constitute a relatively small portion of the total irrigated acreage in the planning area, they were represented, as a generalized percentage of the polygons where alfalfa was the primary crop. Based on a review of the agricultural statistics together with field inspections, a generalized distribution of 5% corn, 12% grains, and 83%

alfalfa was used for these polygons. This information is provided as a crop distribution attribute (% grass, % alfalfa, % grain, and % corn) in the Irrigated Lands GIS data theme ("NEIrr_dd27.shp").

FIELD VERIFICATIONS

HKM toured the basin in the company of local landowners to determine, among other things, the types of crops grown in the various basins of the planning area. The results of this work effort are summarized in the "Irrigation Diversion Operation and Description" memorandum (HKM, 2002).

SUMMARY OF RESULTS

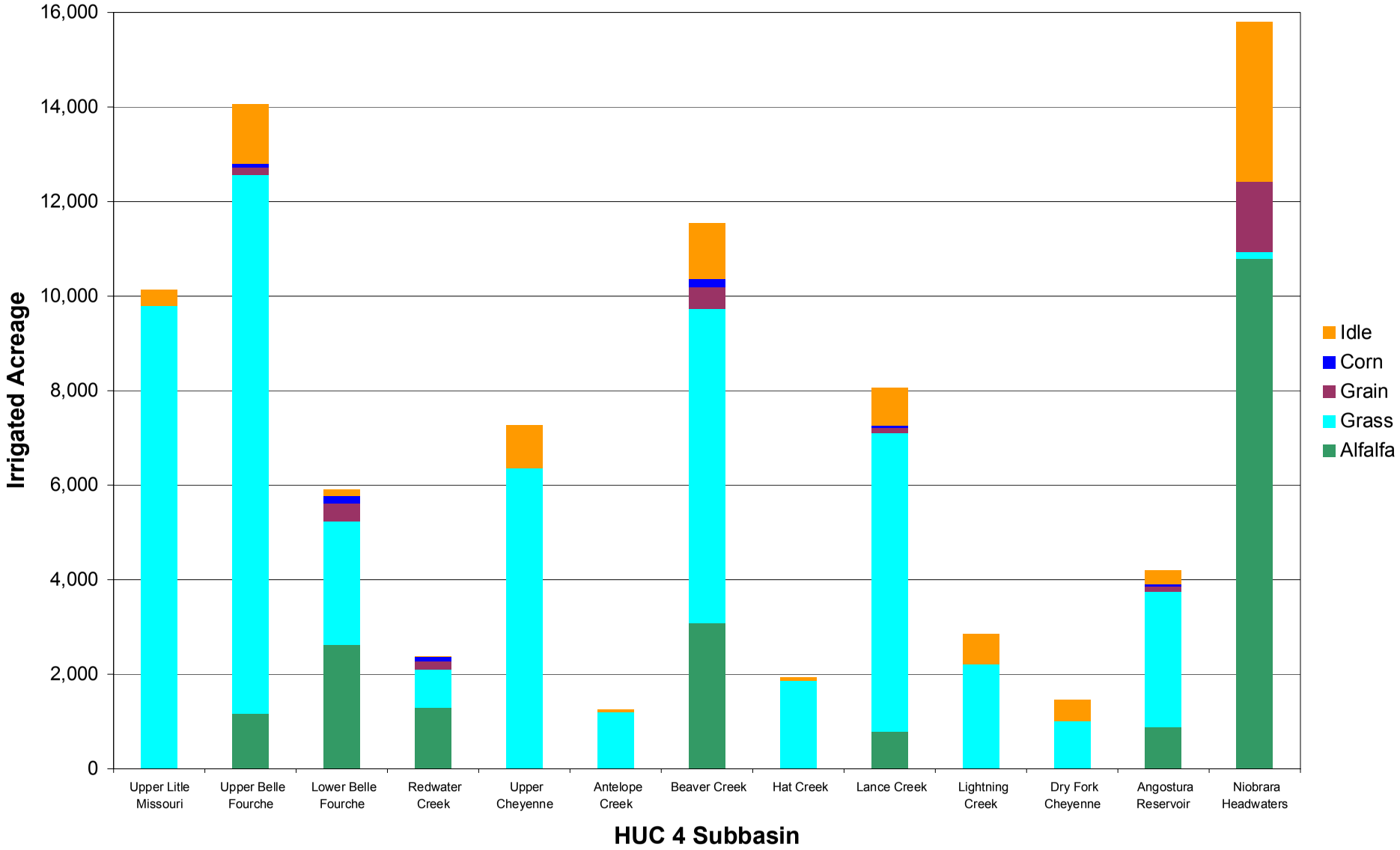
The resulting distribution of irrigated crops is summarized in Table 3 by HUC4 subbasin.

TABLE 3
SUMMARY OF IRRIGATED CROPS (ACRES)

SUBBASIN NAME	HUC	ACREAGE						TOTAL ACTIVE	% OF ACTIVE IRRIGATED ACRES			
		ALFALFA	GRASS	GRAIN	CORN	IDLE	TOTAL		ALFALFA	GRASS	GRAIN	CORN
Upper Little Missouri	10110201	0	9,801	0	0	339	10,140	9,801	0	100	0	0
Upper Belle Fourche	10120201	1,174	11,385	170	71	1,267	14,067	12,800	9	89	1	1
Lower Belle Fourche	10120202	2,633	2,598	381	159	131	5,902	5,771	46	45	7	2
Redwater Creek	10120203	1,292	807	187	78	12	2,376	2,364	55	34	8	3
Upper Cheyenne	10120103	0	6,357	0	0	914	7,271	6,357	0	100	0	0
Antelope Creek	10120101	0	1,199	0	0	51	1,250	1,199	0	100	0	0
Beaver Creek	10120107	3,092	6,648	447	186	1,175	11,548	10,373	30	64	4	2
Hat Creek	10120108	0	1,869	0	0	72	1,941	1,869	0	100	0	0
Lance Creek	10120104	790	6,309	114	48	801	8,062	7,261	11	87	1	1
Lightning Creek	10120105	0	2,211	0	0	643	2,854	2,211	0	100	0	0
Dry Fork Cheyenne	10120102	0	1,014	0	0	454	1,468	1,014	0	100	0	0
Angostura Reservoir	10120106	877	2,860	127	53	288	4,205	3,917	22	73	3	2
Niobrara Headwaters	10150002	10,795	146	1,472	0	3,384	15,797	12,413	87	1	12	0
	TOTAL	20,653	53,204	2,898	595	9,531	86,881	77,350	26	69	4	1

As shown in Table 3, in contrast to the agricultural statistics, HKM mapped a higher percentage of grass than alfalfa. This is likely because much of the irrigated grass land (grass hay or pasture), especially that associated with the more marginal irrigation in the planning area is not reported in the agricultural statistics. The crop acreage summarized here is used as the basis for determining irrigation water consumption in the planning area. The results are shown graphically on Figure 1.

Figure 1
Acreage of Irrigated Land by Crop



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