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Effect of 2001 water allocations on the agricultural landscape and crop production

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Introduction

Agriculture is the predominant land use within the boundaries of the Klamath Project. The project was fully developed by the 1960s, and since that time project irrigation water has been applied to approximately 210,000 acres of cropland annually. The principal crops in terms of acreage are alfalfa, pasture, and barley, followed by other hay, potatoes, and wheat. Other crops of importance include oats, sugarbeets, onions, and horseradish. The acreage, average yields, and crop values of each of these crops for crop years 1998-2000 are presented in Table 1.

The largest single effect of the change in water allocations in 2001 was the tremendous reduction in irrigation water available to agriculture and the resulting changes in crop vegetation in the Klamath Basin. With the prospect of no irrigation water, much of the annual crop ground went unplanted, at least initially. There was immediate concern over the likelihood of severe wind erosion of soil from fields, particularly in fields that were left bare following last year's harvest and were tilled last fall in preparation for spring planting. Many of these fields were eventually seeded in the spring with cover crops—generally barley—to help hold the soil, with little grower anticipation of harvesting a crop.

Immediately after the decision was announced by the U.S. Bureau of Reclamation (BOR) to severely limit irrigation water, growers scrambled to secure water from all available sources, including transfers of water from the Lost River system, development of private wells, and the purchase of ground water from neighbors. Much of this limited, procured water was apportioned to onion or potato production in an attempt by growers to protect existing markets and future contracts. All these activities resulted in a very untypical array of field plantings and vegetative growth in the agricultural landscape.

Major changes in 2001

1. Acreage of spring-seeded, high-value row crops such as potatoes and onions was greatly reduced.

2. Yields of potatoes and onions were near normal because of full season irrigation.

3. Acreage of sugarbeets was reduced to zero. (This was not because of a water shortage but because the closure of two northern California sugar refineries.)

4. The number of idle acres was greatly increased.

5. Barley acreage was greatly increased due to cover crop planting.

6. Much of the barley was harvested for hay because of poor grain yield concerns.

7. The yields of cereals harvested for grain were greatly reduced because of the high percentage of dryland grain.

8. Few or no new plantings were made in alfalfa or peppermint.

9. Grain fields harvested in 2000 were left as stubble fields in 2001 (except for fields that were tilled in the fall of 2000 in preparation for planting in 2001).

10. Weed control was generally not practiced in fallow fields or in dryland fields planted to grain, alfalfa, or peppermint.

11. Major increases in weed seed soil banks are certain.

12. The farm gate value of agricultural production in the project was greatly diminished.

The best available information to track changes in cropping patterns within the Klamath Project is the Annual Crops Report prepared by the BOR. Table 1 summarizes the crop acreage figures compiled by the BOR for the years 1998, 1999, and 2000, along with crop yields and average production values. Unfortunately, figures for the 2001 season were unavailable from BOR at the time of this writing.

Without figures for the entire Project, data from the Tulelake Irrigation District (TID) were evaluated to gain a sense of the magnitude of the vegetation changes that occurred during the 2001 season.

Crop production figures for 3 years, 1998, 1999, and 2000, within the TID are presented on Table 2. Based on a 3-year average, barley was produced on the greatest acreage in the district followed by alfalfa, wheat, and potatoes, respectively. Other important crops in terms of acreage included sugarbeets, onions, pasture, oats, mint, horseradish, and hay other than alfalfa (mostly grass hay). Minor plantings were made of rye and peas. The production value of these crops (farm gate sales) averaged $38,678,000 per year. On average, approximately 1,700 acres of farm ground was idled (fallowed) each year.

Similar figures for the 2001 season for TID are presented on Table 3. There were several notable shifts in the acreage. The number of idled acres jumped dramatically from less than 2,000 acres on average to 23,000 acres in 2001. Onion acreage was reduced to 30 percent of normal. Potato acreage was greatly reduced to less than 14 percent of the previous 3-year average. Wheat acreage was 12 percent of normal. Sugarbeet acreage was reduced to zero, reflecting the closure of two northern California sugar refineries. While the sugarbeet change was in no way related to the water situation, the logical effect of the loss of sugarbeets would have been an increase in the acreage of other row crops, in a normal water year.

Barley, grown for grain, was reduced from the previous years' acreage, but represented a similar percentage of the total planted acreage in 2001 as previously (about 30 percent). However, the reported barley acreage does not include the acreage of barley that was cut for hay because of insufficient soil moisture to make a grain crop. For this reason, the "other hay" crop category jumped to 5,700 acres in 2001 from an average of just over 1,000 acres previously. Peppermint, a relatively new crop to the district, had been expanding in acreage over the past 3

years. In 2001, several mint fields were abandoned and no new fields were established. In addition, a few acres of horseradish were abandoned.

Water management and yield

Following the decision to cut off irrigation in the district, there was general concern about the prospect of serious soil erosion on unplanted ground. Growers made a dedicated effort to seed the fields with a cover crop. Barley was generally selected as the cover crop of choice, given its potential to rapidly cover the ground under cool temperatures and limited moisture conditions. Most of these fields went unirrigated. Many fields produced sufficient top growth to harvest as grass hay. Other fields did mature and produced grain for harvest, but at yield levels well below the typical yield of irrigated fields. Many barley fields did not produce harvestable yield of hay or grain.

Several factors combined to determine the relative yield of individual barley fields. Better yields were attained in barley fields that followed irrigated row crops, primarily due to the presence of residual soil moisture from the previous crop. Yields were also improved by early planting and in some cases by favorable receipt of well-timed, locally heavy rainfall. The mid-season allocation of water by BOR did not help grain crops as the crops had fully matured by that time.

Production of potatoes and onions, although limited, was due to the ability of growers to locate dependable sources of water, sufficient to produce full-season crops. This water was available from existing and newly developed wells, purchases from other landowners, and transfers from other irrigation districts. Potato and onion growers went to great lengths and expense to secure at least some land with water to protect their potato markets and future onion contracts. As water was available full season, water management did not generally affect yields. However, some yield loss in potatoes and onions was attributed to production in less than desirable fields, which were selected only because they had a source of irrigation. Problems in some of these fields were attributed to poor soil tillage, lesser soil types, or less than desirable crop rotations.

Alfalfa is a deep-rooted crop. Most fields in the TID have high soil moisture holding abilities and relatively high-perched water tables. For those reasons, first cutting yields of alfalfa were near normal. However, second cutting was generally poor or non-existent. Many alfalfa growers were able to take advantage of the Department of Interior's mid-season release of 70,000 acre-ft of Upper Klamath Lake water to irrigators in the Project. The resulting mid-season irrigation on alfalfa significantly improved third-cutting yields and reduced the risk of stand losses.

Other perennial crops were also favorably affected by the mid-season allocation of irrigation water. Irrigated pastures responded to the added water, but, for the most part, livestock had been removed from the pastures by that time, so no significant increase in revenue occurred. Nonetheless, the mid-season irrigation did stimulate pasture growth and improved pasture condition, hopefully preventing stand losses this winter. Some peppermint stands may also have been saved by the mid-season water application. But, as with pasture, the mid-season application of water, the only application to peppermint, did not generally result in increased crop harvest.

The mid-season allocation of water also provided some economic relief to growers who were purchasing ground water or relying on other water transfers.

A direct consequence of the reduced water allocation was the tremendous increase in weedy fields. Weed control was generally not practiced on fallow fields. The resulting weed growth in fallow fields ranged from moderate to severe. The large difference in weed growth from field to field were due to (1) differences in weed seed populations in the soil, (2) distinct differences in the ability of individual weed species to germinate and grow under dry soil conditions, (3) tillage practices the previous fall, and (4) soil moisture retention from the previous crop.

Solid, shoulder-high weed growth was observed in many fields. Predominate weeds included those common in local agricultural production (e.g., mustards and kochia) as well as species rarely seen in production fields (principally, prickly lettuce).

Most of the fields that were in grain in 2000 were left as stubble fields in 2001, except for those fields that were tilled in the fall of 2000 in preparation for planting in 2001. The untilled stubble was generally effective in reducing soil erosion. Weed growth on grain stubble fields ranged from very slight to heavy depending mostly on weed populations in the field and the effectiveness of limited rainfall in stimulating weed seed germination.

A major concern for the 2002 crop year, and beyond, is the increase in soil weed seed populations that will certainly result from the weed growth on fallow or stubble fields. The accumulation of tremendous weed seed banks in the soil cause major difficulties in controlling weeds in the next crop cycles. Extensive weed growth in de-watered canals and drain ditches will also serve as a long-term source of weed seed.

Herbicide use was also generally curtailed in dryland grain and alfalfa because of the reduced prospect for offsetting yield increases in the absence of irrigation water. Uncontrolled weeds undoubtedly contributed to reduced yields and quality in these crops.

As a result of all the factors discussed above, the estimated value of crop production in the TID fell from a 3-year average of $38,678,000 to $16,867,000 in 2001. The loss in farm gate value was moderated to some extent by the mid-season allocation of water to alfalfa and horseradish producers and by improved prices for potatoes and alfalfa.

At present, the TID numbers are the best available estimates of the water allocation impact on agricultural production. Extrapolating the numbers from TID to the whole project should be done with caution. More land in TID may have been serviced by wells than was the case in the larger Klamath Irrigation District and other districts. Tulelake soils generally have a much higher water holding capacity than most of the soils in the rest of the Klamath Project. Also, TID has a significantly greater proportion of high-value row crops compared to the project as a whole. For these and other reasons, it is likely that the yield losses in dryland alfalfa and grain were more severe in the balance of the project. In addition, significant stand losses in alfalfa and pastures are more likely on the lighter soils in Oregon irrigation districts. Counter balancing those differences are the relatively normal water allocations in the Langell and Poe valleys and access to Oregon state water rights in some Oregon irrigation districts. A project-wide assessment of the impact on crops will have to await completion of the BOR annual crop report or initiation of an additional data collection effort. Crop production values and the affect of this production on the local and regional economies are covered in detail in other sections of this report.

Table1. CROP PRODUCTION WITHIN THE KLAMATH PROJECT (Data Source: Klamath Project Annual Crop Reports)

CROP	ACREAGE				YIELD(Unit/A)					Value($/A)				Value of Crops			
CALIFORNIA	1998	1999	2000	Average	1998	1999	2000	Average	Units	1998	1999	2000	Average	1998	1999	2000	Average
Barley	25,560	21,591	22,375	23,175	89	89	104	94	bu	169.5	169.5	218.0	185.7	$4,333,000	$3,660,000	$4,878,000	$4,290,000
Oats	1,348	1,689	1,677	1,571	131	131	158	140	bu	170.5	170.5	212.5	184.5	230,000	288,000	356,000	291,000
Wheat	7,299	13,974	10,067	10,447	106	106	86	99	bu	311.6	311.6	253.5	292.2	2,274,000	4,354,000	2,552,000	3,060,000
Other Cereals	313	63	139	172	36	36	86	53	bu	72.0	72.0	171.5	105.2	23,000	5,000	24,000	17,000
Alfalfa	10,452	11,530	12,202	11,395	6	6	6	6	tons	575.0	575.0	575.0	575.0	6,010,000	6,630,000	7,016,000	6,552,000
Other Hay	1,189	851	1,021	1,020	4	4	3	4	tons	300.0	300.0	225.0	275.0	357,000	255,000	230,000	281,000
Irrigated Pasture	2,811	2,766	2,734	2,770	5	5	4	5	aum	150.0	150.0	120.0	140.0	422,000	415,000	328,000	388,000
Peppermint	299	956	1,880	1,045	60	60	65	62	lbs	840.0	840.0	910.0	863.3	251,000	803,000	1,711,000	922,000
Sugarbeets	4,336	4,486	2,393	3,738	21	21	21	21	tons	777.0	777.0	724.5	759.5	3,369,000	3,486,000	1,734,000	2,863,000
Misc Crops	779	806	975	853	4	4	4	4		4,500.0	4,500.0	1,500.0	3,500.0	3,506,000	3,627,000	1,463,000	2,865,000
Onions	2,339	3,175	2,834	2,783	423	423	520	455	cwt	1,903.5	1,903.5	2,600.0	2,135.7	4,452,000	6,044,000	7,368,000	5,955,000
Potatoes	9,556	7,797	7,427	8,260	400	400	500	433	cwt	2,320.0	2,320.0	2,062.5	2,234.2	22,170,000	18,089,000	15,317,000	18,525,000
Pea Seed			168	168			14	14				140.0	140.0			24,000	24,000
Idle Acres	5,747	5,182	1,965	12,894													
Total	72,028	74,866	67,857	80,292										$47,396,000	$47,655,000	$43,000,000	$46,033,000
OREGON	1998	1999	2000	Average	1998	1999	2000	Average	Units	1998	1999	2000	Average	1998	1999	2000	Average
Barley	16,692	16,507	15,497	16,232	88	92	118	100	bu	178.5	175.4	229.3	194.4	$2,980,000	$2,893,000	$3,553,000	$3,142,000
Oats	5,306	3,705	3,416	4,142	145	151	158	151	bu	195.5	196.5	212.5	201.5	1,037,000	728,000	726,000	830,000
Wheat	1,954	3,741	3,421	3,039	96	99	86	94	bu	325.8	291.0	253.5	290.1	637,000	1,089,000	867,000	864,000
Other Cereals	660	547	264	490	40	54	86	60	bu	79.2	108.0	171.5	119.6	52,000	59,000	45,000	52,000
Alfalfa	35,416	36,556	39,110	37,027	5	5	6	5	tons	450.0	450.0	522.5	474.2	15,937,000	16,450,000	20,435,000	17,608,000
Other Hay	15,087	13,324	14,997	14,469	3	4	3	3	tons	225.0	262.5	225.0	237.5	3,395,000	3,498,000	3,374,000	3,422,000
Irrigated Pasture	40,827	40,345	38,987	40,053	4	4	4	4	aum	120.0	120.0	120.0	120.0	4,899,000	4,841,000	4,678,000	4,806,000
Silage/ensilage	305	390	1,123	606	7	7	7	7	tons	420.0	420.0	420.0	420.0	128,000	164,000	471,000	254,000
Other Forage			60	60			3	3	tons			180.0	180.0			11,000	11,000
Peppermint	24	545	505	358	70	60	65	65	lbs	980.0	840.0	910.0	910.0	24,000	458,000	459,000	314,000
Sugarbeets	2,731	3,067	1,479	2,426	21	22	19	21	tons	924.0	814.0	655.5	797.8	2,523,000	2,497,000	969,000	1,996,000
Horseradish		20	21	21			2	2				330.0	330.0			6,000	6,000
Onions	1,082	744	422	749	400	400	500	433	cwt	1,800.0	1,800.0	2,500.0	2,033.3	1,948,000	1,339,000	1,055,000	1,447,000
Potatoes	7,141	7,029	5,339	6,503	385	400	500	428	cwt	2,233.0	2,320.0	2,062.5	2,205.2	15,946,000	16,307,000	11,011,000	14,421,000
Pea Seed			60	60			14	14				140.0	140.0			8,000	8,000
Potato Seed			50	50			200	200	cwt			400.0	400.0			20,000	20,000
Misc	260	595	227	361										468,000	6,030,000	1,434,000	7,932,000
Idle Acres	2,918	3,617	3,699	3,411													
Total	130,403	130,732	128,676	130,057										$114,000	$114,000	$113,000	$114,000
Project Total	202,431	205,598	196,533	210,349										$47,510,000	$47,769,000	$43,113,000	$46,146,000

Table 2. CROP PRODUCTION WITHIN THE TULELAKE IRRIGATION DISTRICT (Data Source: TID Annual Reports)

	ACREAGE				YIELD (UNITS/A)					UNIT VALUE ($/UNIT)				TOTAL CROP VALUE ($)			
	1998	1999	2000	3 Year Average	1998	1999	2000	3 Year Average	Units	1998	1999	2000	3 Year Average	1998	1999	2000	3 Year Average
Barley	21,219	16,468	18,798	18,828	43.0	62.0	56.5	53.8	cwt	4.07	4.05	4.23	4.12	$3,714,000	$4,135,000	$4,493,000	$4,114,000
Wheat	7,157	13,478	10,215	10,283	62.3	66.4	60.8	63.2	cwt	5.42	5.27	4.65	5.11	2,416,000	4,716,000	2,885,000	3,339,000
Oats	1,475	965	1,067	1,169	42.0	50.0	55.0	49.0	cwt	4.50	4.00	4.25	4.25	279,000	193,000	249,000	240,000
Peas	37	280	158	158	25.0	25.0	25.0	25.0	cwt	12.00	12.00	12.00	12.00	11,000	84,000	47,000	47,000
Sugarbeets	4,038	4,203	2,379	3,540	23.0	20.0	21.0	21.3	tons	45.00	43.00	41.00	43.00	4,179,000	3,615,000	2,048,000	3,281,000
Alfalfa Hay	9,723	10,862	11,659	10,748	5.8	5.8	5.7	5.8	tons	90.00	90.00	95.00	91.67	5,075,000	5,621,000	6,369,000	5,688,000
Other Hay	1,092	253	869	738	4.0	3.8	4.0	3.9	tons	65.00	65.00	70.00	66.67	284,000	62,000	243,000	196,000
Pasture	1,752	1,707	1,700	1,720	4.0	4.0	4.0	4.0	aum	10.00	10.00	10.00	10.00	70,000	68,000	68,000	69,000
Potatoes	9,527	7,912	7,572	8,337	400.0	450.0	500.0	450.0	cwt	4.04	4.44	2.78	3.75	15,396,000	15,808,000	10,525,000	13,910,000
Onions	2,292	2,963	2,703	2,653	423.0	423.0	470.0	438.7	cwt	5.00	5.00	5.00	5.00	4,848,000	6,267,000	6,352,000	5,822,000
Mint	299	940	1,775	1,005	70.0	40.0	90.0	66.7	lbs	14.00	14.00	12.00	13.33	293,000	526,000	1,917,000	912,000
Rye	28	28	139	65	20.0	30.0	30.0	26.7	cwt	3.50	3.50	3.25	3.42	2,000	3,000	14,000	6,000
Horseradish	766	781	979	842	2.5	2.5	2.5	2.5	tons	500.00	500.00	500.00	500.00	958,000	977,000	1,224,000	1,053,000
Idle Acres	2,500	998	1,652	1,717													
TOTALS	59,405	60,840	60,013	61,803										$37,525,000	$42,075,000	$36,434,000	$38,678,000

Table 3. 2001 CROP PRODUCTION WITHIN THE TULELAKE IRRIGATION DISTRICT (Data Source: TID Annual Report)

	ACREAGE	YIELD (UNIT/A)	UNITS	UNIT VALUE($)	PRODUCTION VALUES($)
Barley	12,916	35.0	cwt	$4.23	$1,912,000
Wheat	825	47.5	cwt	4.07	160,000
Oats	525	38.0	cwt	6.50	91,000
Peas	605	12.5	cwt	14.00	106,000
Sugarbeets	0	0.0	tons	0.00	0
Alfalfa Hay	12,416	4.5	tons	110.00	6,146,000
Other Hay	5,761	2.3	tons	85.00	1,102,000
Pasture	1,288	0.0	aum	10.00	0
Potatoes	1,162	430.0	cwt	5.56	3,975,000
Onions	779	420.0	cwt	4.75	1,554,000
Mint	1,151	65.6	lbs	12.00	906,000
Rye	31	20.0	cwt	3.50	2,000
Horseradish	830	2.2	tons	500.00	913,000
Idle Acres	23,140				
TOTAL	61,429				$16,867,000