

TWO RIVERS NATIONAL WILDLIFE REFUGE

Lower Swan Lake Drawdown

Seed Yield and Duck-energy Day Estimates

September 2012

Summary

Brian Loges submitted pressed seed heads randomly collected from 19 plots located along two transects in Lower Swan Lake (Figure 1) to the University of Tennessee Wetlands Program for moist-soil plant seed production and duck-energy day (DED) estimates. Pressed seed heads were received on 5 October 2012, seed-head area for each sample was scanned, and area (cm²) estimates were used to predict dry seed mass (g) per plant using models in Gray et al. (2009). Plant species that were collected included redroot flatsedge (*Cyperus erythrorhizos*), rice cut grass (*Leersia oryzoides*), Amazon strangletop (*Leptochloa panicoides*), wild millet (*Echinochloa crus-galli*), Walter's millet (*Echinochloa walteri*), and nodding smartweed (*Polygonum lapathifolium*). Additional seed-producing plants were observed, but were not collected because either an equation did not exist in Gray et al. (2009) for the species (e.g., *Eragrostis hypnoides*) or seed of the plant was not known to be eaten commonly by waterfowl (e.g., *Amaranthus*). Seed production/plant was multiplied by plant density/m² for each species, seed production was summed across species within a plot, and estimates were converted to kg/ha and lbs/ac. Duck-energy day estimates were calculated using seed production, true metabolizable energy of seed, and the daily energy requirement of mallards (Reinecke et al. 1989). Details on methods are available at <http://fwf.ag.utk.edu/mgray/DED/DED.htm>. Seed production and DED estimates were averaged among plots for each transect, and the standard deviation and 95% confidence intervals were calculated.

Seed production along Transect 1 ranged from 850 – 7796 kg/ha (758 – 6956 lbs/ac, Table 1). Average seed production for Transect 1 was 5082 kg/ha (4532 lbs/ac, Table 2), and could be classified as very high seed yield (see reference values below). Seed production along Transect 2 ranged from 801 – 5179 kg/ha (715 – 4621 lbs/ac, Table 1). Average seed production for Transect 2 was 2857 kg/ha (2552 lbs/ac, Table 2), and also could be classified as very high. Across both transects, average seed production was **3971 kg/ha** (3564 lbs/ac). High seed production in Lower Swan Lake was influenced by high density of redroot flatsedge, which averaged 128 plants/m² (SD = 52). Based on the plant species present and high seed production, moist-soil wetlands in Lower Swan Lake could be classified as early successional. Duck-energy day estimates are provided for both transects (Table 2). Total estimated DEDs for Lower Swan Lake (1319 ac) was 18,053,153 DEDs, which is equivalent to having the energetic potential to support **164,120 ducks/day for 110 days**. Based on previous studies (Gray et al. 1999, Kross et al. 2008), the energetic carrying capacity in Lower Swan Lake during autumn 2012 is unprecedented and will provide significant quality habitat for migrating waterfowl.

Seed Production Reference Values¹

- <200 kg/ha = low production
- 200-600 kg/ha = moderate production
- >600 kg/ha = high production

¹Based on moist-soil production estimates provided in Gray et al. (1999) and Kross et al. (2008).

Literature Cited

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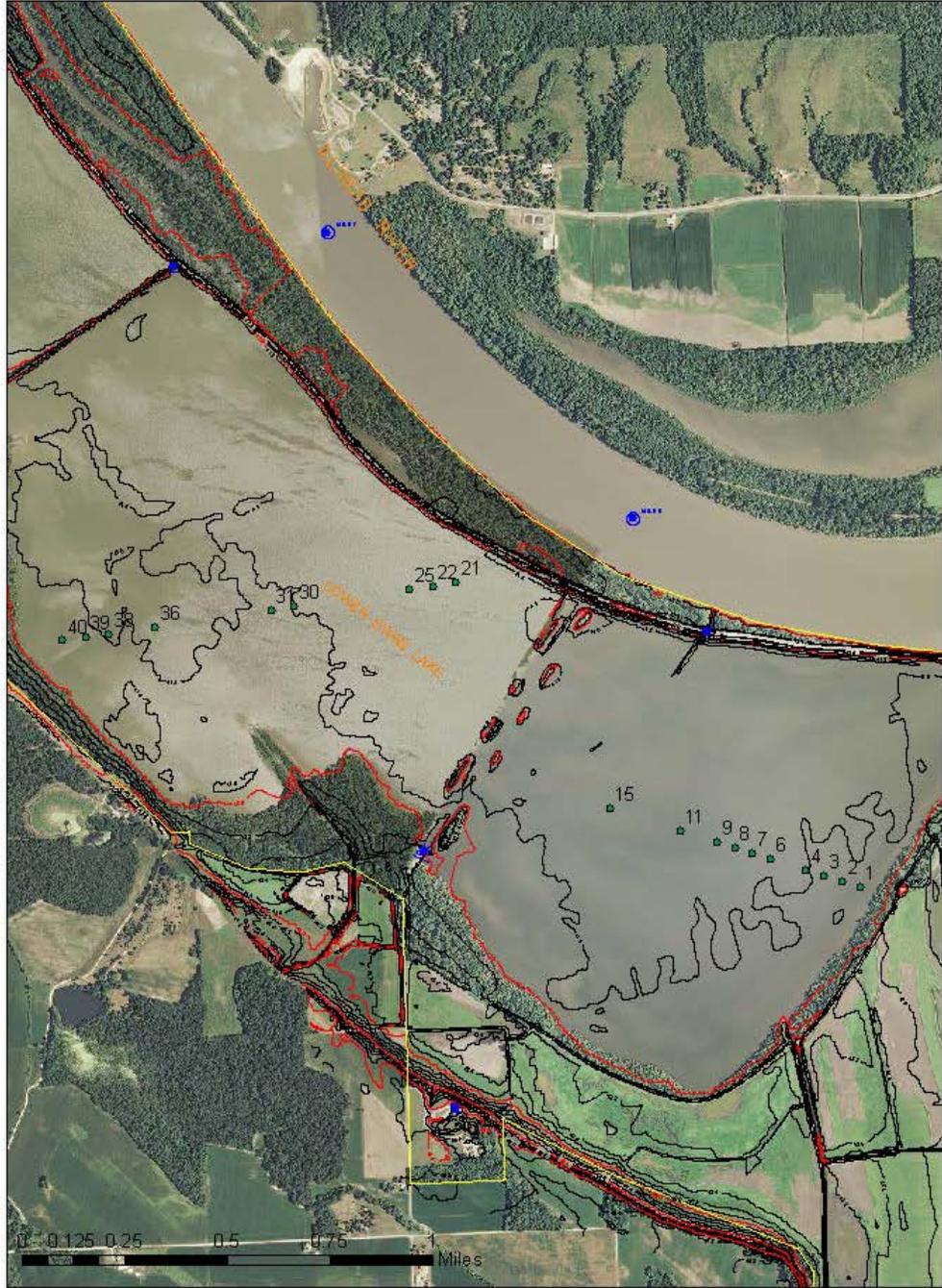


Figure 1. Transects 1 (plots 1 – 15) and 2 (plots 21 – 40) where stem density of seed-producing plants was estimated and seed heads were collected for scanning seed-head area and predicting seed yield, Lower Swan Lake, Two Rivers National Wildlife Refuge, September 2012.

Table 1. Estimates of seed production¹ and duck-energy days (DED)² along two transects in Lower Swan Lake, Two Rivers National Wildlife Refuge, September 2012.

Transect	Plot	kg/ha	DED/ha	lbs/ac	DED/ac
1	1	4407	37367	3932	15102
	2	2695	22876	2405	9235
	3	7796	66317	6956	26713
	4	3795	32102	3386	13003
	6	850	7117	758	2913
	7	6496	54949	5796	22258
	8	7025	59428	6268	24072
	9	7438	62915	6636	25485
	11	5055	43017	4510	17322
	15	4591	38833	4096	15730
	2	21	2889	24434	2577
22		1461	12284	1303	5005
25		3395	28719	3029	11633
30		5179	43808	4621	17745
31		3752	31741	3348	12857
36		4616	39047	4119	15817
38		1639	13865	1462	5616
39		801	6781	715	2744
40		2018	17070	1800	6914

¹Estimates predicted from scanned seed-head area of moist-soil plants using models in Gray et al. (2009).

²Duck-energy days quantified by multiplying seed production by true metabolizable energy of seed and dividing by the daily energy requirement of mallards (Reinecke et al. 1989).

Table 2. Descriptive statistics for seed production¹ and duck-energy days (DED)² for Lower Swan Lake along two transects, Two Rivers National Wildlife Refuge, September 2012.

Transect	Variable	\bar{x} ^{3,4}	SD	95% Confidence Interval	
				Lower	Upper
1	lbs/ac	4534	2097	2509	6559
	DED/ac	17183	7628	10377	23989
	kg/ha	5082	2350	2813	7351
	DED/ha	43061	19942	23807	62316
2	lbs/ac	2552	1336	1262	3842
	DED/ac	9803	5131	4849	14757
	kg/ha	2857	1600	1160	4555
	DED/ha	24164	13550	9802	38526
1 and 2	lbs/ac	3564	1933	2432	4696
	DED/ac	13687	7424	9339	18035
	kg/ha	3971	2227	2624	5319
	DED/ha	33627	18894	22196	45059

¹Estimates predicted from scanned seed-head area of moist-soil plants using models in Gray et al. (2009).

²Duck-energy days quantified by multiplying seed production by true metabolizable energy of seed and dividing by the daily energy requirement of mallards (Reinecke et al. 1989).

³ $n = 10$ and 9 plots (1-m^2) for transect 1 and 2, respectively; $n = 19$ for combined calculation.

⁴Using the combined data from transects 1 and 2, total estimated DEDs for Lower Swan Lake (1319 acres) = 18,053,153 DEDs, which is equivalent to having the capability of energetically supporting 164,120 ducks per day for 110 days.