

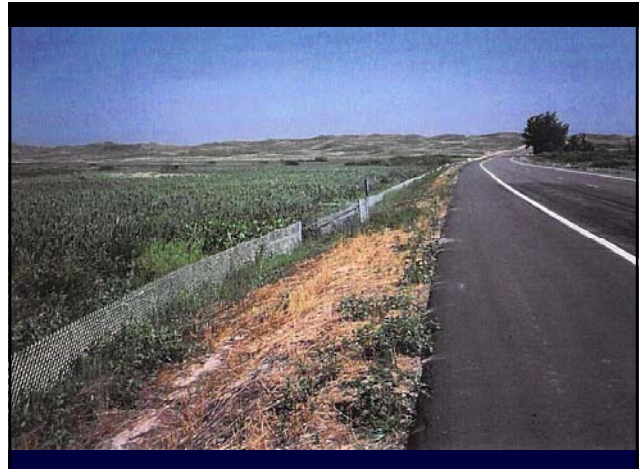
Blanding's Turtles in the Nebraska Sand Hills : Spatial Ecology of a Mega Population

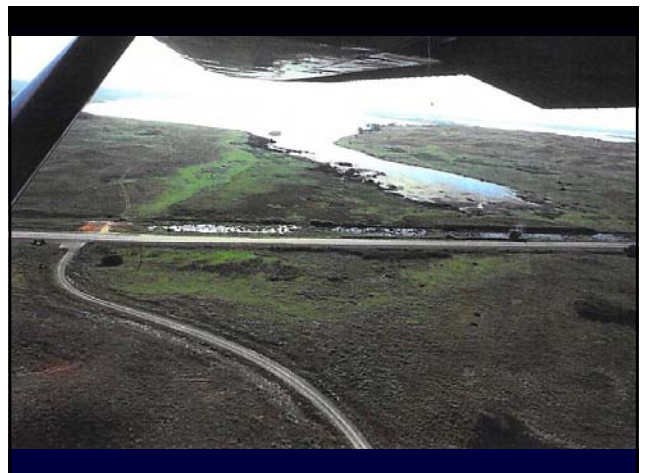
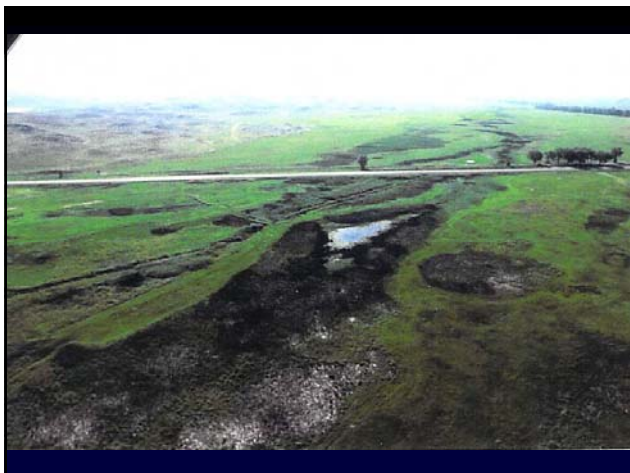
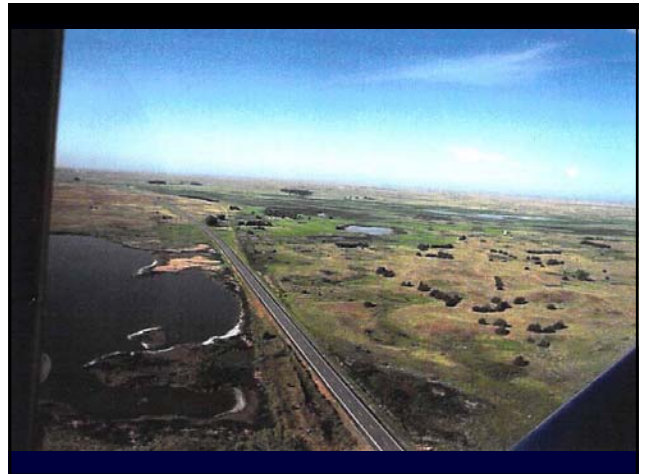
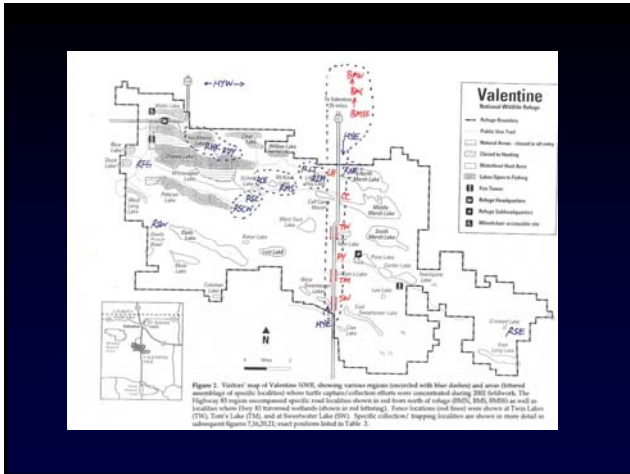


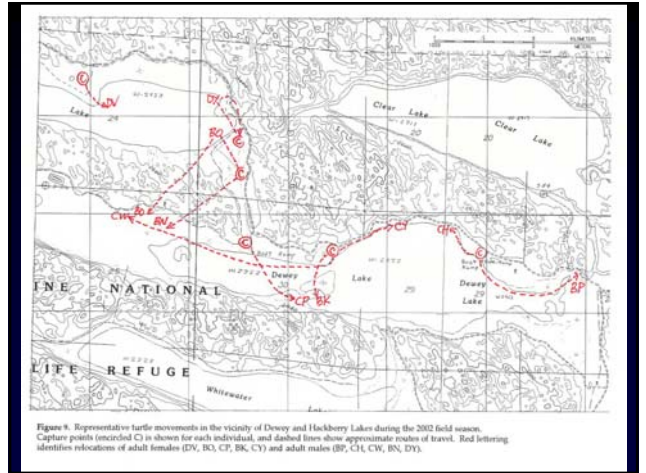
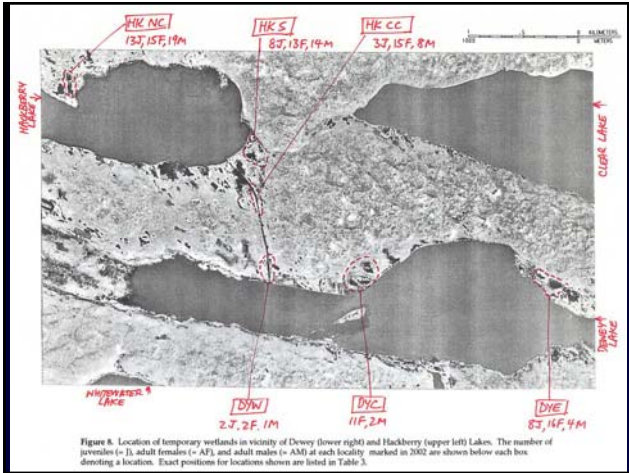
Jeffrey W. Lang, Professor / Research Biologist,
U. North Dakota, U. Minnesota
jeff.w.lang@gmail.com ; 651 646 0203

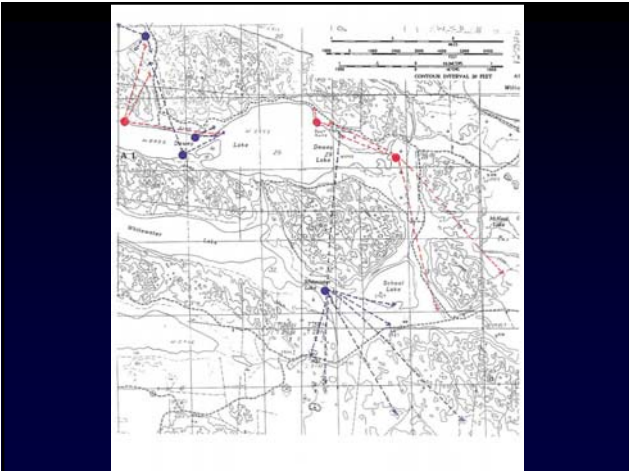
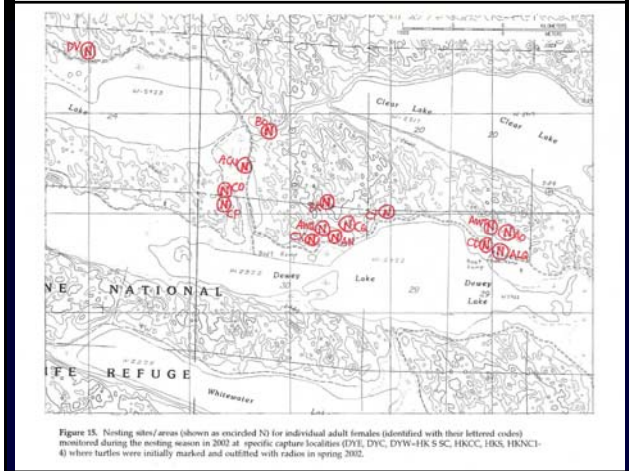


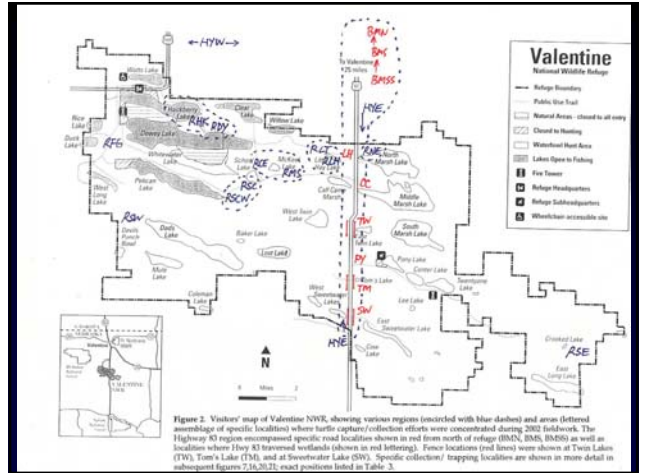
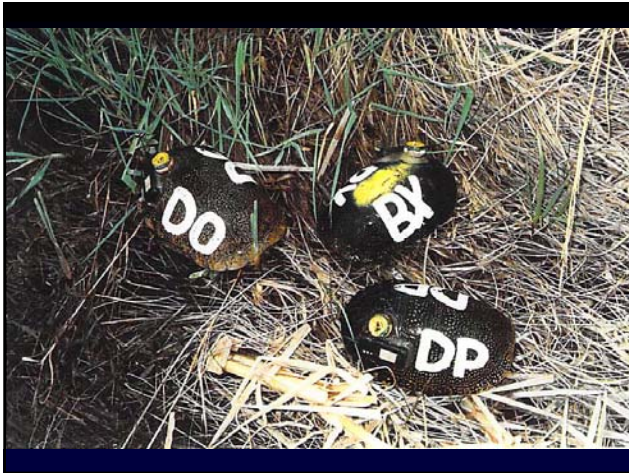
Figure 1: Vicinity Map

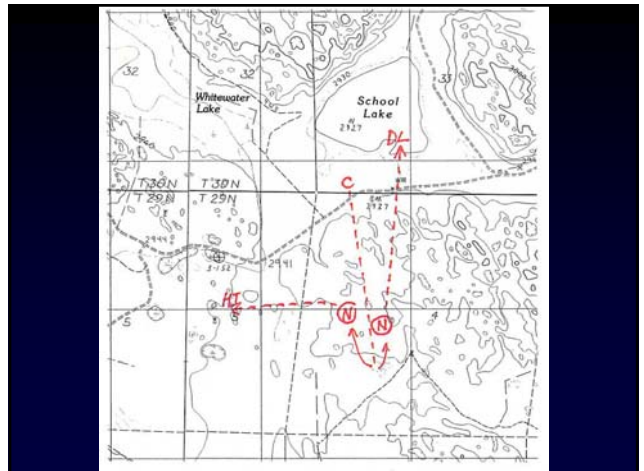
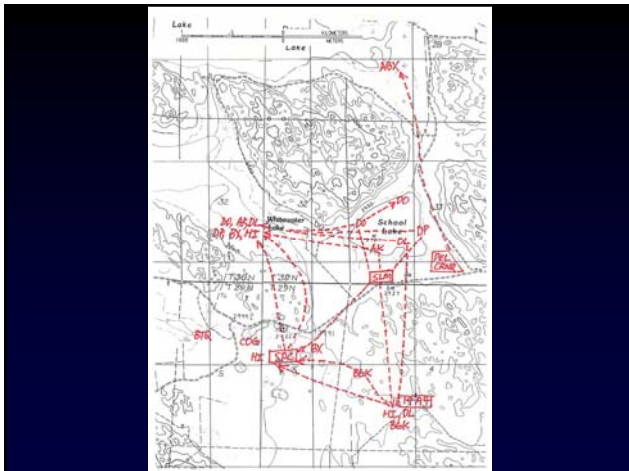
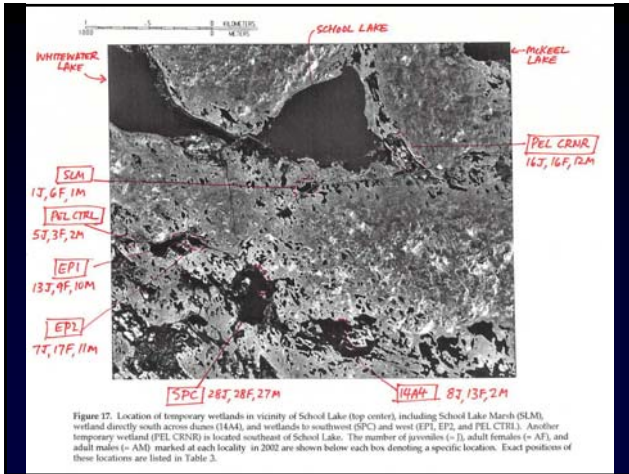


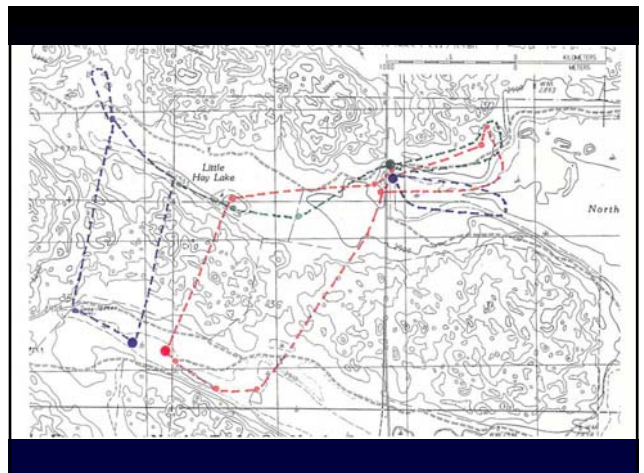
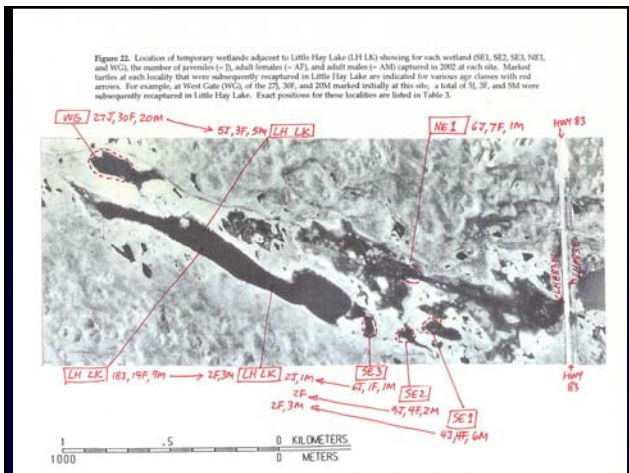
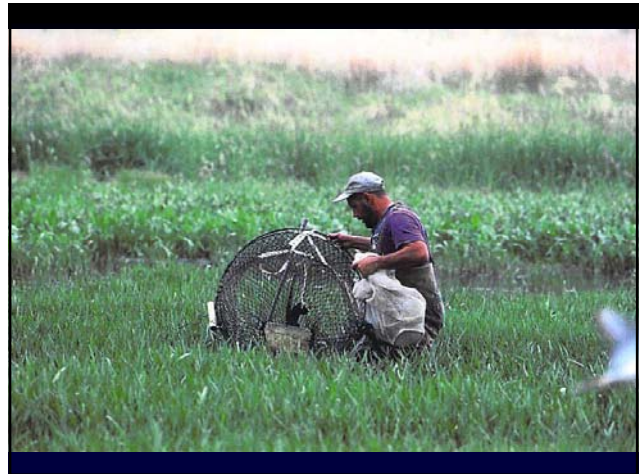
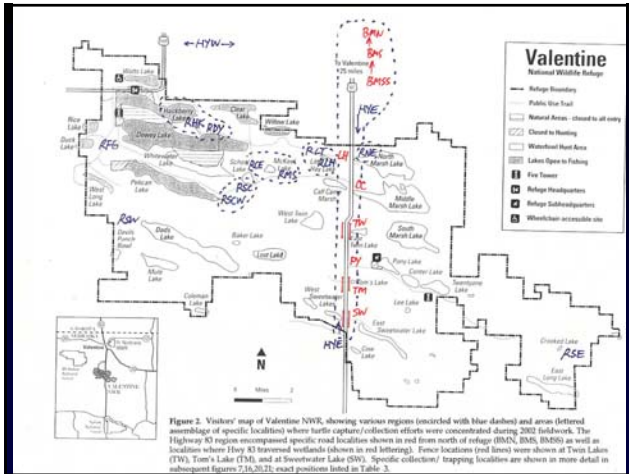












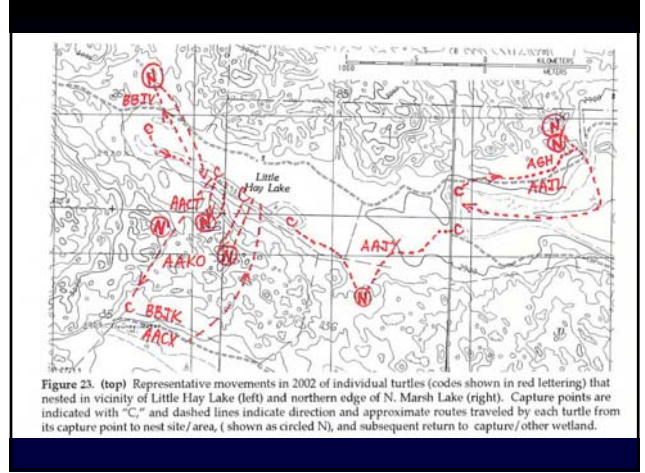


Figure 23. (top) Representative movements in 2002 of individual turtles (codes shown in red lettering) that nested in vicinity of Little Hay Lake (left) and northern edge of N. Marsh Lake (right). Capture points are indicated with "C," and dashed lines indicate direction and approximate routes traveled by each turtle from its capture point to nest site/area, (shown as circled N), and subsequent return to capture/other wetland.





N	home range	hectares (ha)	distance (m)	travel distance (m)
18	R	6-12	250-1000	900-1750
26	M	14-20	750-3000	1500-7100
14	MM	24-32	1000-4400	4000-8325
8	MMM	36-74	2300-5000	3875-10500

Table 27A. Summary table of spatial use by Blanding's turtles on Valentine NWR, based on analyses of movement patterns of 66 radiotracked individuals. The relationships between home range types (R,M,MM,MMM) and turtle age/sex/size (top half of table) and area location inhabited (mid section of table) is presented. Additional details of spatial use by the 66 turtles are outlined in Table 27.

age/sex/size	ages				totals	
	R	M	MM	MMM		
juveniles	2-11	3		1	1	5
adult females	12-16		3		2	5
adult females	17-21	6	4	2	1	13
adult females	22+	4	9	8	4	25
adult males	12-16		3	1		4
adult males	17-21	2	2	1		5
adult males	22+	3	5	1		9
		18	26	14	8	66

age/sex/size	ages	ages				totals
		R	M	MM	MMM	
juveniles	2-11	3		1	1	5
adult females	12-16		3		2	5
adult females	17-21	6	4	2	1	13
adult females	22+	4	9	8	4	25
adult males	12-16		3	1		4
adult males	17-21	2	2	1		5
adult males	22+	3	5	1		9
		18	26	14	8	66
HYE		6	5	1	3	15
RLH/RLT		-	7	4	-	11
RDY		6	5	3	-	14
RHK		5	7	-	1	13
RSC		1	1	6	4	12
RNW		-	1	-	-	1

location	area (ha)	actual	actual + 50%	estimate -20%	estimate	estimate +20%
DWY C/E	11	76	120	142	178	214
HK S	30	190	280	368	460	552
LH	45	308	388	634	792	950
SPC/SLM	60	336	454	656	820	984
totals	146	910	1242	1800	2250	2700
turtles per hectare		6.2	8.5	12.3	15.4	18.5

Table 32. (top half of table) Density estimates of Blanding's turtles on Valentine NWR, calculated using Petersen Index (modified Lincoln Index) of recaptured turtles (marked in 2002, recaptured in 2003) for representative areas. Estimates of total turtles in specific areas are bounded by approximate 95% confidence limits, +/- 20% of estimated values. Actual turtles captured (adults + juveniles) are shown, as well as actual adults + estimated juveniles (=actual adults, assuming juveniles are 50% of total population) for each area. Average turtle densities, using 5 different values for population size, in box mid-table.

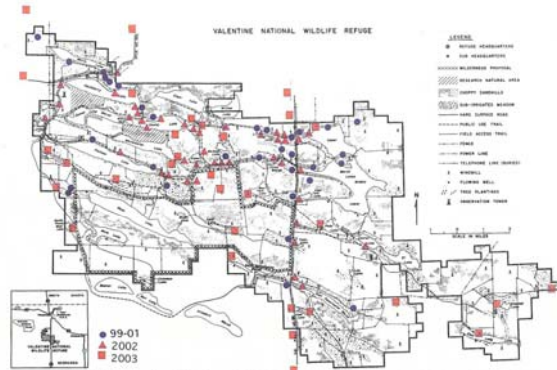


Figure 4. Distribution of Blanding's turtles on the Valentine NWR, based on previous records noted by Len McDaniel, Refuge Biologist for 1999-2001 (blue dots), and on current records collected during 2002 (red triangles) and 2003 (red squares) on this project. In 2002, collector effort was focused on the Highway 83 region (HYE) and the lakes and associated wetlands along the Hackberry-Dewey-Little Hay Lakes across road and the Pelican-School Lakes across road. In 2003, additional collecting was focused on the eastern, southeastern, southern, and south-western areas within refuge boundaries, where previous records were sparse or non-existent. Exact positions for 2002-2003 records are listed in Tables 3 and 4.

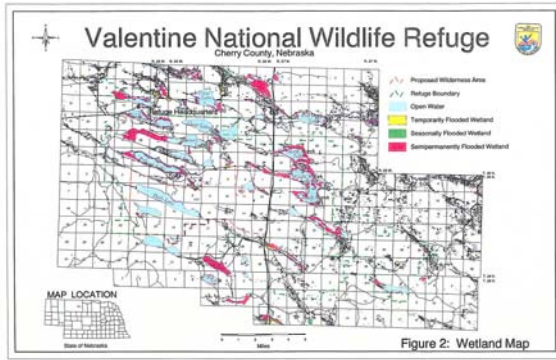


Figure 2A. Map of wetlands on Valentine NWR (Figure 2 in USFWS, Comprehensive Conservation Plan for Valentine NWR, 1999). On basis of data provided on p. 43 of CCP (cited above), lake area=786 ac or 2881 ha, temporary wetland area=735 ac or 297 ha, seasonal wetland area=1584 ac or 643 ha, semi-permanent wetland area=83 ac or 33 ha. Total wetland area=13,831 ac or 5597 ha. These values are probably based on late 1970s aerial photography, and represent wetland area during a relatively dry climatic cycle. Values for wetland area based on late 1980s aerial photography (INAP 1988) represent extensive wetland area following a number of wet years during the 1980s. Values used in this study are shown in Table 4-6. Lake area=14,133 ac or 5720 ha, wetland area=10,506 ac or 4244 ha. Total wetland + lake area=25,059 ac or 10,144 ha. This value is almost double the value listed in the CCP for wetland area on Valentine NWR.

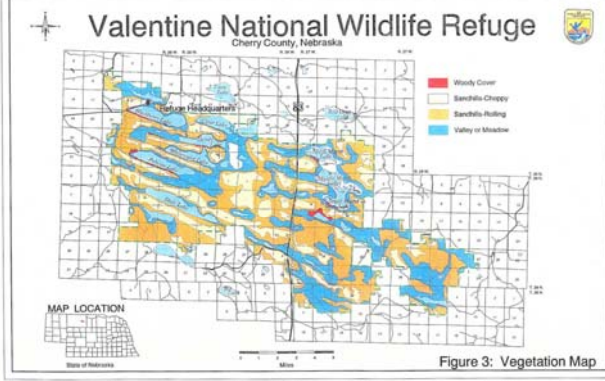


Figure 2B. Map of vegetation cover type on Valentine NWR (Figure 3 in USFWS, Comprehensive Conservation Plan for Valentine NWR, 1999). On basis of estimates derived directly from this figure by summing same colored areas, sandhills area=56% of total 71722 acres on VSNWR, = 41,600 acres or 16635 ha. Rolling sandhills area=27,972 acres or 11,320 ha, choppy sandhills area=13628 acres or 5515 ha. Meadows area=20,798 acres or 8417 ha, and open water (lakes)=9324 acres or 3773 ha. Meadow and lakes represent valleys=30,122 acres or 12,190 ha.

turtles per hectare		6.2	8.5	12.3	15.4	18.5
habitats						
lk/wtld all	10144	62900	86200	124800	156200	187700
lk/wtld A/B	8913	55300	75800	109600	137300	164900
lakes only	5730	35500	48700	70500	88200	106000
wetlands only	4414	27400	37500	54200	72400	81700

(bottom half of table) Total population estimates for various categories of habitats on VNW are shown in bottom columns on right. For example, the total population estimated for lake/wetland habitats (~8913 hectares; categories A + B in Table 3B) on VNW is 137,300, with lower and upper values (95% confidence limits) of 109,600 and 164,900, respectively. All of estimates in bottom half of table are rounded to nearest 100 animals.



Table 34A Comparison of fenced vs. unfenced road-kills near wetlands on US Hwy 83 at Valentine NWR and at Ballard Marsh SWMA

locality US83	protection status	% turtles road-killed	road-killed juveniles	road-killed adults	road-killed turtles	live-caught juveniles	live-caught adults	live-caught turtles	total turtles dead & live
Ballard Marsh	not fenced	68%	9	37	46	12	10	22	68
Little Hay	not fenced	63%	51	16	67	17	22	39	106
Calf Camp	not fenced	63%	15	4	19	5	6	11	30
	not fenced all	65%	75	57	132	34	38	62	204
Twin Lakes	fenced	21%	8	2	10	22	15	37	47
Tom's Lake	fenced	27%	4	4	8	10	12	22	30
Sweetwater	fenced	26%	9	3	12	26	8	34	46
	fenced all	24%	21	9	30	58	35	93	123

Table 34A. Six sites along US HWY 83 at Valentine NWR and at Ballard Marsh SWMA were monitored for turtles, including road-killed animals and those collected alive crossing the road or walking along the fences. At unfenced localities (top of table: Ballard Marsh, Little Hay, Calf Camp), road-killed turtles averaged 65% of all those encountered. In contrast, at fenced localities (bottom of table: Twin Lakes, Tom's Lake, Sweetwater), road-killed turtles made up 24% of all those encountered. Thus, fencing reduced road-kill by a factor of 2X, resulting in only 30 turtles killed at the fenced localities, vs. 132 turtles road-killed at the unfenced localities. Most road kills at the fenced localities were of turtles that walked around the ends of the fences into traffic lanes. Improvements in fence design and placement will likely reduce road-kill appreciably, likely to levels below 10% or less.

LITTLE HAY @ HWY 83 (LH @ 83)

turtle density	8.5 t/ha actual		15.4 t/ha estimate		8.5 t/ha actual		15.4 t/ha estimate	
	juveniles	adults	juveniles	adults	juveniles	adults	juveniles	adults
population est	12,000	22,000	12,000	22,000	12,000	22,000	12,000	22,000
	rdkill	%est pop	%est pop	rdkill	%est pop	%est pop	rdkill	%est pop
A average 02-03	26	0.2	0.1	8	0.06	0.04		
B avg 02-03 wkld	34	0.3	0.1	11	0.09	0.05		
C avg alive+dead	52	0.4	0.2	42	0.4	0.2		
D 2X alive+dead	104	0.9	0.5	84	0.7	0.4		
E 10X avg 02-03	260	2.2	1.2	80	0.7	0.4		
X threshold	1%	120	220	0.5%	60	110		
Y threshold	2%	240	440	1%	120	220		
Z threshold	3%	360	660	2%	240	440		
A	26	22%	9%	8	13%	7%		
C	52	43%	24%	42	70%	38%		

BALLARD MSH N @ B3 (BMN @ B3)

turtle density	8.5 t/ha actual		15.4 t/ha estimate		8.5 t/ha actual		15.4 t/ha estimate	
	juveniles			adults				
population est	3,000		5,500		3,000		5,500	
	rdkill	%nest pop	%nest pop	rdkill	%nest pop	%nest pop	rdkill	%nest pop
A average 02-03	5	0.2	0.1	19	0.6	0.3		
B avg 02-03 wkd	7	0.3	0.1	25	0.8	0.5		
C avg alive+dead	11	0.4	0.2	24	0.8	0.4		
D 2X alive+dead	22	0.9	0.5	48	1.6	0.9		
E 10X avg 02-03	50	2.2	1.2	190	6.3	3.5		
X threshold	1%	30	55	0.5%	15	28		
Y threshold	2%	60	110	1%	30	55		
Z threshold	3%	90	165	2%	60	110		
A	5	17%	9%	19	126%	68%		
C	11	37%	20%	24	160%	86%		



management challenges of Blanding's turtle, with reference to Minnesota populations

- road mortality clearly major threat to conservation of species
- seasonal overland movements by turtles of all ages/sizes/sexes
- sizeable buffer to encompass wetlands and travel corridors
- mosaic of wetlands & upland nesting habitats to be protected
- spotty distribution, fragmented habitats, northern range limits
- metro habitats altered extensively, necessitating containment
- rural land use is compatible, e.g. dairy pastures, stock ponds
- local threats are population-specific, focus conservation effort

key features of Blanding's turtle life history

- long-lived, 50-70 yrs, long-term data exceptional
- delayed maturation, at ~14 to 20 years of age
- prolonged reproduction, >30 to 50 years
- low natural mortality on juveniles & adults
- high natural mortality of eggs & hatchlings
- recruitment uneven, not necessarily annual
- seasonal utilization of temporary wetlands
- dependence upon uplands, as well as wetlands
- mosaic of habitats, with safe travel corridors
- specific habitats: overwinter, nesting, summer

