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An Economic Valuation of South Dakota Wetlands As A Recreation Resource for Resident Hunters

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AN ECOMOMIC VALUATION OF SOUTH DAKOTA WETLANDS AS A RECREATION RESOURCE FOR RESIDENT HUNTERS

BY

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AN ECONOMIC VALUATION OF SOUTH DAKOTA
WETLANDS AS A RECREATION RESOURCE
FOR RESIDENT HUNTERS

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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INTRODUCTION

In spite of efforts to conserve wetlands, intensified agriculture, water projects, and urban development annually diminish the quantity and quality of wetland resources (Weller 1981). Leitch and Danielson (1979) noted that when the discounted value of the returns to drainage exceed drainage costs there is an economic incentive to drain. If present drainage rates continue, Weller (1981) estimated that most wetlands will disappear by the year 2140. Research has only recently focused attention on the need to estimate the public value of wetland benefits and the social costs of drainage (Leitch and Danielson 1979). The disparity between private and social benefits of wetlands has intensified public concern over the extent of wetland drainage (Leitch and Danielson 1979). Matson (1964) reported that a lack of information concerning wetland social benefits has made it difficult to provide a solid foundation for wetland policy decisions.

Economic valuations of wetlands are based on the recognition that wetlands yield a flow of services valuable to society (Shabman and Batie 1981). Services or benefits are either indirect (e.g. flood protection) or direct (e.g. production of wildlife and recreation opportunities). The benefits of wetlands as a recreational resource are well documented in the literature (Hammack and Brown 1974, Jaworski and Raphael 1978, Horwitz 1979).

This study is concerned with public and private wetlands in South Dakota and the population of hunters that utilize them. Characteristics of importance include: number of resource users, geographic relationship between user populations and the resource, the quantity and quality of the resource, and resource ownership (Hammack and Brown 1974, Thibodeau and Ostro 1981, Palm and Malvestuto 1983). The objective was to estimate the direct economic benefits of South Dakota wetlands as a recreation resource for resident hunters.

STUDY AREA

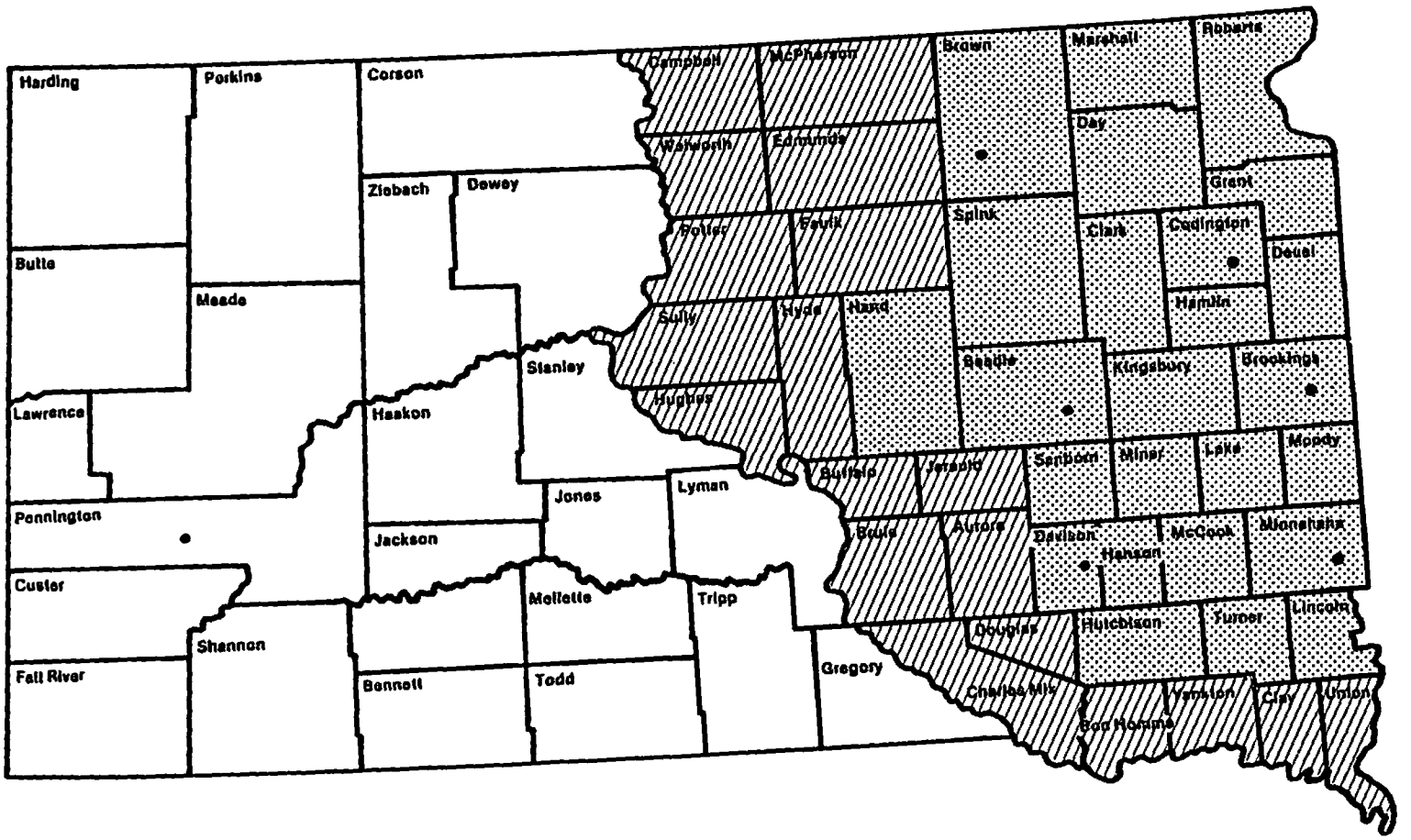
South Dakota is a sparsely populated agricultural state with a 1980 population of 690,768 (U.S. Bureau of the Census 1981). Over 53% of all residents live on farms or in small rural communities (populations of 1,000 or less). The remaining 47% of the population reside in urbanized areas. Only 10 South Dakota urbanized areas have populations over 10,000 (U.S. Bureau of the Census 1981). During the past decade population loss has occurred in 53 of the 66 counties, primarily migration from rural to urban regions (Riley and Baer 1981). The density of farms and communities is higher in eastern South Dakota than west of the Missouri River.

In 1980, 25% of the residents hunted and fished in

South Dakota (U.S.D.I. 1982). With most of the hunter population concentrated in eastern South Dakota. A survey of the 1982 Basic and Sportsman's Combination license holders by county showed that the distribution of licenses was: Eastern counties 55%, Central counties 19%, and West River counties 26% (Fig. 1).

Flint (1955) delineated 12 natural landform regions in South Dakota. For purposes of data analysis these regions have been pooled into 3 macro-regions that reflect the distribution of wetlands in the state (Fig. 1). Ruwaldt et al. (1979) estimated that there were 441,000 ha of temporary, semipermanent, and permanent natural ponds and lakes in South Dakota and reported an additional 88,000 ha impounded by stock dams. They divided the state into physiographic regions. I have combined their regions into three geographic regions. Wetland resources in these three regions are not uniformly distributed; 67% of the natural ponds and lakes were in the Eastern Region, 30% in the Central Region, and < 4% in the West River region (Fig. 1). An estimated 80% of all stock dams are in western South Dakota (Ruwaldt et al. 1979).

Estimates by South Dakota Department of Game, Fish and Parks (1975) indicated that 169,000 ha of the wetlands in the state are publicly owned or held in public trust. Included in the estimate were Waterfowl Production Areas, Game Production Areas with wetland habitat, meandered lakes,



▨ EASTERN REGION ▨ CENTRAL REGION □ WEST RIVER REGION ● POPULATION CENTERS

FIGURE I GEOGRAPHIC AREAS USED FOR ANALYSIS OF DATA COLLECTED FROM 1982 RESIDENT HUNTERS

and National Wildlife Refuges. Approximately 75% of the public wetlands were located in the Eastern Region, 19% in the Central Region, and 6% in the West River Region. Public wetlands created by mainstem reservoirs on the Missouri River were excluded from the estimate of Ruwaldt et al. (1979) and were also excluded in this study. Private wetlands (360,000 ha) were defined for this study as all temporary, semipermanent and permanent ponds and lakes, riparian areas, and stock impoundments on private property.

METHODS

Hammack and Brown (1974) noted that measuring the value of a recreation resource is among the most difficult in resource economics. A major problem is determining a market value for recreation benefits (Palm and Malvestuto 1983). Hunting on South Dakota wetlands is either free or offered at a minimal price and the recreational benefits derived are non-market goods; alternative prices and quantities cannot be obtained directly elsewhere. Additional valuation difficulties arise because different user groups, waterfowl hunters and deer hunters, for example, utilize the resource to different degrees and perceive different benefits from the recreation experience. Wetland water level, vegetation, and associated wildlife may vary seasonally and influence the participation of user

types and the intensity and pattern of use (Hansen 1977).

Value Interpretation

To establish an economic value, a demand function must be estimated for recreational use of wetlands by resident hunters. A demand curve exists for non-market goods (such as wetlands) but is unobservable because the price or entry fee is zero and higher prices (in the form of wetland rental fees) have not been observed (Martin and Gum 1982). Clawson and Knetsch (1966) reported that the recreation experience is composed of five phases, including anticipation and preparation, travel to the site, on-site experience, travel from the site, and recollection of the experience. When measuring the value of an outdoor recreation site such as a wetland, the value of the recreation site must be separated from the value of the whole recreational experience. Clawson and Knetsch (1966) argued that the demand curve for the recreation site itself is derived by treating added costs (alternative levels of entrance fees) to the number of visits to the site.

Use of questionnaires to determine the willingness of recreationists to pay for the right or sell the right to use the resource was described by Thibodeau and Ostro (1981). Economists have generally agreed that willingness-to-pay is the appropriate measure of that part of the benefits sportsmen derive from hunting that can be attributed to the resource (Charbonneau and Hays 1978).

Willingness-to-pay in excess of costs payed is the valuation measure that was used in this study (Fig. 2), although willingness-to-sell was also calculated.

The amount a resource user (hunter) is willing to pay above the costs he or she is presently paying before foregoing a particular recreation activity (hunting on wetlands, for example) is a measure of consumers' surplus. Numerous researchers, including Scott (1965), have questioned the validity of "hypothetical answers" to hypothetical willingness-to-pay questions. Hammack and Brown (1974), however, reported that estimates of consumers' surplus were significantly related to the independent variables, household income after taxes, number of seasons of waterfowl hunting, annual costs of hunting, bag per day, and days of hunting per season. Wennegren (1967) argued that it seems unnecessary to require the extraction of consumers' surplus values in the form of collectable revenues as a prerequisite to attributing their value to the resource (in this case, wetlands).

Willingness-to-sell is a measure of the amount the consumer must be paid to induce him to stop using a particular resource. As noted by Hammack and Brown (1974) willingness-to-sell may be the appropriate measure of value for public lands (Waterfowl Production Areas, for example) if some alternative land use were contemplated. Thibodeau and Ostro (1981) suggested that willingness-to-sell values

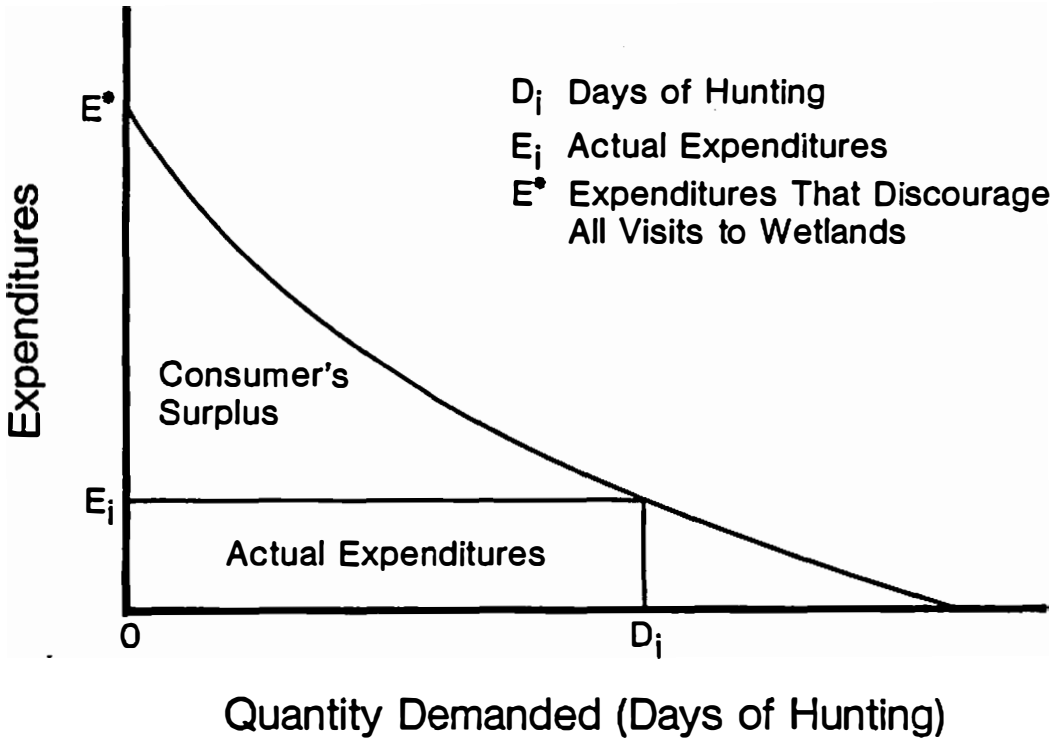


FIGURE 2. Hypothetical Demand Curve

are appropriate where the wetlands under consideration are controlled by the public and can be hunted by anyone with a license. Willingness-to-sell values were used in this study for a separate valuation of public wetlands.

Opportunity costs were measured as income foregone (Thibodeau and Ostro 1981, Keith and Workman 1974) as estimated by questionnaire respondents. Opportunity costs and expenditures for hunting reflect the costs incurred traveling to, using, and returning from the recreation site and are necessary in calculating a total user-oriented value. Palm and Malvestuto (1983) noted that expenditures do not measure net benefits attributable to the resource. However, actual expenditures are indicators of secondary benefits to the business community generated by the resource (Trice and Wood 1958).

Average consumers' surplus values obtained from questionnaire responses as willingness-to-pay were expanded by a factor which related sample size and the population of hunters hunting wetlands to the total number of license holders (Palm and Malvestuto 1983). Expanded consumers' surplus values were used to compute dollar per wetland hectare values. These values were then discounted at 7.87% (the 1983 rate used by the U.S. Army Corps of Engineers) to obtain a total monetary value for all wetlands in the state. Sample willingness-to-sell values were expanded, discounted, and used to calculate per hectare values for public wetlands

(Thibodeau and Ostro 1981).

Actual expenditures for wetland-related hunting were determined first on a statewide basis; average estimated daily expenditures (from questionnaire responses) were multiplied by the total number of respondents that hunted wetlands and expanded as described above.

A wetland hunting questionnaire pertaining to the 1982 season was prepared using the user estimate (Bart et al. 1979) or direct question method as described by Randall (1981). Hunters were queried directly about number of seasons hunted, species preferred for hunting, number of days each species was hunted, number of species bagged on public and private wetlands, number of hours hunted, satisfaction from hunting, hunting experience attributes, leasing arrangements, willingness-to-pay, size of wetlands hunted, county of residence, county most hunted, age, sex, education and income after taxes (Appendix A).

Questions were patterned after existing models. Hunter satisfaction and hunting experience attribute questions were modified forms of designs by Potter (1970), Brown (1975), and Hautalouma and Brown (1978). Expenditure, opportunity cost, and willingness-to-pay questions were patterned after those of Hammack and Brown (1974). As recommended by Randall (1981) the increment for willingness-to-buy the privilege to use a resource to determine consumers' surplus and the decrement of

willingness-to-sell that right were made specific to wetlands and were defined with the questions.

Photographs of temporary, semipermanent, and permanent wetlands were printed on the first page of the questionnaire accompanied by a definition of public and private wetlands. The remainder of the first page was designed to involve the respondent in answering expected questions such as years of hunting experience, species preference, and satisfaction. The three inner pages contained the more difficult questions regarding hunting experience attributes, opportunity costs, and willingness-to-pay. The sensitive inquiries about education and income were placed on the last page as recommended by Hammack and Brown (1974). A portion of the last page was left blank and respondents were asked for their perception of the value of wetlands to their hunting experience. A pre-test of the questionnaire was conducted. The final questionnaire included 28 items (Appendix A).

Resident Basic Fish and Game and Sportsman's Combination licenses for 1982 were stratified by county and a 1% random sample was drawn from each county. A total of 1,737 licenses was drawn.

The questionnaire was mailed in March after all regular hunting seasons had closed. One month after the intitial mailing, a follow-up questionnaire was mailed to non-respondents.

RESULTS AND DISCUSSION

The initial mailing of 1,737 resulted in the return of 857 questionnaires (49%). An additional 196 questionnaires (12%) were returned after the second mailing. Total returns were 1,053; a return rate of 61%. Approximate return rates were Eastern region 61%, Central region 21%, and West River region 18%.

PARTICIPATION

Approximately 67% of the respondents indicated that hunting was extremely important when compared to other forms of outdoor recreation (Table 1). Respondents reported that they were introduced to hunting at an early age, 79% began hunting between 15-20 years of age. The average number of years hunted was 21.50, indicative of the interest in hunting beyond the novice years. Less than 12% indicated a decrease in hunting interest over the past five years (Table 1).

Questionnaire responses showed that resident hunters made extensive use of wetlands in pursuit of game species in four categories: waterfowl, upland game, big game, and predators. Approximately 25% hunted wetlands for game species in one category, 35% in two categories, and 30% in three categories. Over 9% hunted species in all four categories. However, respondents indicated preferences

Table 1. Responses of South Dakota hunters to questions concerning the importance of hunting compared to other forms of outdoor recreation and changes in interest in hunting over the past five years.

Response Category	N	Response in Percent
Importance of hunting compared to other forms of outdoor recreation.		
Of little importance	13	2
Moderately important	218	31
Extremely important	476	67
No response	7	<1
Interest in hunting over the past five years.		
Increased	286	41
Remained the same	335	48
Decreased	77	11
No response	7	<1

among game species categories (Table 2).

Of the 1,053 respondents that returned the questionnaire, 705 indicated that they hunted wetlands at least once during the 1982 season. The estimated number of resident hunters that hunted on wetland habitats at least once during the 1982 season was 116,890. One hundred and ninety eight respondents indicated that they did not hunt during the 1982 season, and an additional 150 did not hunt wetlands. Most non-hunters were Basic License holders that fished only. The proportion of non-hunters in each geographic region was approximately equal to the percentage of license holders in each of the three regions.

The 705 hunters in the sample that hunted wetlands spent an average of 23.9 days hunting on wetland habitat; the range of hunter days was 1-99. Total days of hunting were 11.24 on public wetlands and 12.64 on private wetlands. The average number of hunter days expanded from the sample generated an estimate of 2,791,333 days of wetland-related hunting activity by South Dakota hunters. Respondents indicated that they hunted wetlands an average of 3.5 hours per day afield. The number of days each hunter spent hunting species in each of the 4 categories varied as did the use of public and private wetlands (Table 3).

Table 2. Frequency that South Dakota residents preferred hunting 5 categories of game during the 1982 season.

Response Category	N	Importance Rating (Frequency)[a] 1	2	3	4	No response
Waterfowl						
Ducks, geese	521	160	178	122	55	184
Upland game						
Pheasants, gray partridge, cottontail rabbits, doves	666	311	240	94	19	39
Big Game						
White-tailed deer	536	208	142	153	27	169
Predators						
Fox, Coyote	452	15	53	115	259	253

[a] Rating scale range from 1 (first preference) to 4 (last preference);

No response includes those that did not hunt species in a category.

Table 3. Mean number of days by game species category that resident hunters spent on public and private wetlands during the 1982 season.

Response Category	Hunter-days on Public Wetlands	Hunter-days on Private Wetlands
Waterfowl		
Ducks, geese	3.28	3.13
Upland game		
Pheasants, gray partridge, cottontail rabbits, doves	5.23	5.99
Big Game		
White-tailed deer	2.01	1.97
Predators		
Fox, coyote	0.72	1.55
TOTAL	11.24	12.64

ECONOMIC

The actual wetland-related hunting expenditures reported by 680 of the 705 respondents was $140,358, an average of $206.41 per hunter for the season. Hammack and Brown (1974) reported an average seasonal expenditue of $301.00 for waterfowl hunters in seven western states. Thibodeau and Ostro (1981) reported expenditures of $391.00 for waterfowl-small game hunters in Massachusetts in 1977. The lower expenditure levels found in this study were expected given the low per capita income in South Dakota (U.S. Bureau of the Census 1981) and the short travel distance to abundant wetland resources for the bulk of the hunter population (Thompson 1983).

EXPENDITURES

The expanded estimate of actual expenditures based on questionnaire responses for all wetland related hunting in South Dakota was $24,127,265; 36% of all 1980 hunting expenditures in South Dakota as estimated by United States Department of Interior (1982). Approximately 57% was expended while hunting on private wetlands and 43% on public wetlands. The ratio of private to public hectares of wetland is 3.1:1; thus expenditures were approximately 1.6 times greater per hectare on public wetlands than on private.

Although 57% of all wetland related hunting occurred on private wetlands, less than 6% of the hunters surveyed

indicated that they leased or rented wetlands for hunting. Consequently private landowners received little direct economic benefit from hunters for wetland related hunting activities in 1982.

OPPORTUNITY COSTS

The pay lost by self-employed respondents while hunting on wetlands was included as an opportunity cost. One hundred and thirty three respondents took 715 days without pay to hunt wetlands; an average of 1.01 days for the 705 respondents that hunted wetlands during the 1982 season.

An average pay per day value of $58.33 was estimated from U.S. Bureau of the Census (1981) data for single worker households in South Dakota. Estimated pay lost per hunter per season was $58.91. The expanded total pay lost for all hunters that hunted wetlands was $6,885,990.00. Thibodeau and Ostro (1981) reported $48.40 in pay lost per season for waterfowl-small game hunters.

CONSUMERS' SURPLUS

Consumers' surplus (willingness-to-pay) data were used to obtain an estimate of the value of all public and private wetlands in South Dakota as a recreation resource for resident hunters. Questionnaire respondents indicated they would be willing to pay an average of $289.90 above their present costs rather than forego hunting on wetlands during the 1983 season. This amount equates to an average

of $12.13 per hunter day. Hammack and Brown (1974) reported a consumers' surplus value of $247.00 each season for waterfowl hunters in seven western states.

The consumers' surplus value measured as willingness-to-pay in excess of present payment was $33,886,411 for all resident South Dakota hunters estimated to have hunted wetlands. The expanded consumers' surplus value was discounted and used for comparison with the value of reclaimed wetlands put to agricultural use. When the consumers' surplus value was discounted at 7.875% it yielded $430,303,630.00. This figure divided by the estimated 529,00 ha of all public and private wetland in South Dakota produced an estimated value of $813.42 per ha ($325.26/ac) for all wetlands as a recreational resource for resident hunters.

WETLAND AND AGRICULTURAL VALUE COMPARISONS

Current agricultural land values for Eastern, Central, and West River regions (which approximate the regions delineated in this study) were $1,837.50 ha ($735.00 ac), $930.00 ha ($372.00 ac), and $660.00 ha ($264.00 ac), respectively (Federal Land Bank of Omaha 1982). The average cost for draining wet soils ammortized over 50 years at 13.5% was estimated by Diedrick (1981) to be $232.50 ha ($93.00 ac). The values of drained wetlands for agricultural purposes in 1982 were $1,605.00 ha ($642.00 ac) East River, $697.50 ha ($279.00 ac) Central, and $427.50 ha

($171,00 ac) West River. (Table 4)

In the Eastern region the value of public and private wetlands combined as a recreation resource ($813.42) is approximately 50% of the value of drained wetlands used for agricultural purposes. The most productive agricultural land in South Dakota is in the Eastern region and these results were to be expected. Productivity and consequently land values decrease in Central and West River regions and the recreation value of these wetlands exceeded that of agriculture by 1.1 and 1.9 times, respectively.

Participation in wetland related hunting, expenditures, and willingness-to-pay above present cost values varied between the three regions (Table 4). The mean number of days of wetland-related hunting were similar in all three regions. However, the number of hunters from the Eastern region that hunted on wetland habitat was 1.6 times greater than the other regions combined.

Expenditures and opportunity cost of hunters that resided in the Central region were the highest of the three regions. Consumers' surplus values from respondents in the Eastern and Central regions were similar but values of West River region hunters were 33% below the average of $290.00

It was apparent that consumers' surplus may vary in proportion to expenditures and opportunity costs. In the Eastern and Central regions, consumers' surplus values were approximately 1.1 times greater than expenditures and

Table 4. Mean estimates of selected economic values for wetlands as a recreation resource for resident hunters for the 1982 season for each region in South Dakota.

Economic Values	Region Eastern	Region Central	Region West River
Days of participation per hunter	25.26	23.20	21.05
Actual expenditures and opportunity costs per hunter	$268.30	$291.62	$252.78
Consumers' surplus per hunter	$292.83	$310.02	$195.33
Actual expenditures and opportunity costs per hunter day	$10.62	$12.56	$12.00
Consumers' surplus per hunter day	$11.59	$13.36	$9.27

opportunity costs. Only in the West River region which contains about 4% of the wetlands of the state was the consumers' surplus value lower. Hunters who reside in the Eastern region contributed approximately three times more to the total consumers' surplus than hunters from the Central region and four times more than West River region hunters. With most of the hunter population and wetlands concentrated in the eastern region, these results were to be expected.

Palm and Malvestuto (1983) reported differences in consumers' surplus between types of reservoir users. Over 75% of all respondents in this study indicated that they hunted species in more than one game species category in wetland habitat. Consequently, a specific consumers' surplus was not calculated for each different type of wetland hunter.

PUBLIC AND PRIVATE WETLAND VALUE COMPARISONS

Consumers' surplus data were also analyzed to evaluate the value of private and public wetlands for hunting separately for each of the three geographic regions. In all three regions, monetary values calculated per ha for private wetlands were higher than the $813.42 figure estimated for public and private wetlands combined (Table 5).

Although the value of private wetlands for hunting is slightly less than the value of wetlands altered for agriculture in the Eastern region they are an important

Table 5. Monetary value of private wetlands as a recreation resource by regions for resident South Dakota hunters.

	REGIONS			
	Eastern	Central	West River	Combined
Estimated number of hunters that hunted private wetlands	58,503	20,654	28,871	108,028
Estimated ha. of private wetlands	179,520	96,560	83,920	360,000
Mean number of days of hunting on private wetlands	12.53	11.68	12.28	
Consumers surplus per day	$11.50	$13.36	$9.27	
Per ha value of private wetlands for recreation discounted at 7.875%	$1,211.78	$842.00	$853.33	

component in the spectrum of wetland recreational resources. Randall (1981) noted that hunting and fishing sites are congestible goods; crowding reduces their recreational utility. The continued loss of private wetlands to drainage will place increased hunting pressure on public areas potentially reducing both the quantity and quality of the hunting experiences available to South Dakota hunters.

The value of public wetlands was 25% less than private wetlands in the Eastern region. The per ha values for recreation in the other two regions were approximately the same as or higher on public wetlands than on private wetlands (Table 6). The number of hectares of public wetlands and the days of hunter use decreased from Eastern to Western regions. However, the high intensity use of public wetlands in the Central and West River regions generated higher per ha values for hunting than public wetland use in the Eastern region.

WILLINGNESS-TO-SELL VALUES

The data obtained from responses to the willingness-to-sell question (a hypothetical question about the respondents' willingness-to-sell hunting privileges on public wetlands) were used to compute a separate and alternative valuation for public wetlands. As noted by Hammack and Brown (1974) this question elicited strong reactions in their survey by some respondents. In my study, approximately 12% responded that they would not sell their

Table 6. Monetary value of public wetlands, as a recreation resource by regions for resident South Dakota hunters.

	REGIONS			
	Eastern	Central	West River	Combined
Estimated number of hunters that hunted public wetlands	61,075	20,433	26,441	107,919
Estimated ha of public wetlands	126,750	32,110	10,140	169,000
Mean number of days of hunting on public wetlands	12.72	11.52	8.77	
Consumers' surplus per day	$11.50	$13.36	$9.27	
Per ha value of public wetlands for recreation discounted at 7.875%	$902.06	$1,243.65	$2,691.96	

privilege to hunt on public wetlands or they quoted a high figure such as a million dollars. The average willingness-to-sell value excluding the no-sale and high price responses was $376.34 per respondent. Obviously eliminating the willingness-to-sell estimates of 12% of the respondents that value wetlands highly would result in an underestimation. When these responses were assigned the maximum monetary value listed with the question ($1,000.00) the average willingness-to-sell increased to $460.88. Willingness-to-sell values were not constrained by income and were thus greater than consumers' surplus values.

The ratio of willingness-to-sell to willingness-to-pay values in this study was 1.6:1 compared to 4:1 reported by Hammack and Brown (1974). The lower ratio found in this study is not surprising since the decrement for selling hunting privileges in the Hammack and Brown (1974) study was loss of waterfowl hunting privileges for a season; the decrement in this study was loss of hunting privileges on public wetlands for a season (hunting on private wetlands and upland habitat was noted in the question as allowable.)

The expanded estimate of willingness-to-sell for all resident hunters that hunted wetlands was calculated to be $53,872,264 and represented the amount resident hunters would have to be paid to give up their privilege to hunt public wetlands during the 1983 season. When the expanded

estimate was discounted at 7.875% and divided by the 169,000 ha of public wetlands, the estimated value as a resource for hunting is $4,047.88 per ha.

Approximately 47% of the public wetland hunters were residents of cities with populations of > 2,500. Although urban residents were the primary users of public wetlands their willingness-to-sell values were not significantly higher than the other three residency categories. Nor was any significant difference found in willingness-to-sell values between six hunter age categories. These findings suggested that public wetlands were equally important and highly valued by the entire cross-section of South Dakota hunters.

OTHER RESULTS

Approximately 44% of the respondents spent their youth as part of a farming operation, followed by 28% in cities of > 2,500, 23% in towns of <2,500, and 5% in the country but not part of a farming operation. Over 44% indicated that they now live in cities with populations of >2,500, which reflects the emigration from rural areas noted by Riley and Swanjord (1982).

Wetland use varied with wetland size. Wetlands of > 40 ha were most utilized by 32% of the hunters, 0.4 to 20 ha by 27%, 20 - 40 ha by 24%, and < 0.4 ha by 17%. Ruwaldt et al. (1979) suggested that the bulk of South Dakota wetlands and stock impoundments were < 4 ha (19 ac) in size. Only

Table 7. Ratings in 8 selected hunting attributes by resident South Dakota hunters for the 1982 season.

Response Category	N	IMPORTANCE RATINGS IN PERCENT 1	2	3	4	5	6	7	8
Companionship									
Hunting with friends/relatives	676	21	21	18	14	7	6	6	3
Companionship	658	4	14	17	18	15	15	10	7
Harvest									
Bagging game	669	9	6	10	11	14	15	33	3
Getting my limit	653	1	2	4	4	5	8	14	62
Skill									
Outsmarting game	664	9	9	14	13	20	19	10	6
Making a difficult shot	659	3	8	12	14	20	21	14	8
Nature aesthetics									
Being outdoors	675	32	20	13	11	9	5	6	3
Watching wildlife	676	21	23	14	16	9	8	5	4

Rating scale range from 1 (most important hunting attribute) to 8 (least important).

10% of all wetland hectares were meander lakes; most were >40 ha (100 ac) in size.

Hunter use of large wetlands was proportionally higher than the availability of large wetlands. Thompson (1983) reported significant differences in use among wetlands for recreation. He attributed the difference in use to condition of the wetlands. He noted that South Dakota waterfowl hunters preferred hunting large wetlands, particularly those in hemi-marsh condition. Wennegren and Fullerton (1972) reported that 82% of the "economic rent" generated by Utah pheasant hunters could be explained by site quality parameters in the 16 counties studied.

Four hunting experience attributes discussed by Hautalouma and Brown (1978) were examined in this study: companionship, harvest, skill, and nature-aesthetics. Respondents ranked nature-aesthetics, companionship, skill, and harvest in decreasing order of importance to their hunting experience (Table 7). These findings are similar to those of More (1973). He reported that aesthetic benefits (being close to nature), affiliations with hunting companions, and the challenge of the hunt received the highest ratings. Harvest was rated positively by nearly all investigator's but was frequently rated below the previously mentioned attributes.

The quality of a hunting experience is a function of how well the multiple satisfactions desired by the consumer

(hunter) are fulfilled (Hendee 1974). Over 34% of the respondents indicated that they were extremely satisfied with their wetland related hunting experience, 44% were moderately satisfied, 15% somewhat satisfied, and 7% dissatisfied (Table 8). These were relatively high ratings considering an average pheasant crop, below average waterfowl production in the Central Flyway, and a wet fall in 1982, which delayed harvest and made hunting difficult. The following quote was typical of many comments written by respondents.

> "Wetlands are the primary source for my son and myself to enjoy waterfowl hunting in this area. We usually go to a GPA not far from our farm to hunt and with fair success. But it is a beautiful place just to watch waterfowl and enjoy the outdoors together."

Over 81% of the respondents reported that hunting was better than expected or about as expected during the 1982 season. Approximately 83% of those respondents that indicated that the 1982 season was either somewhat satisfying or dissatisfying also indicated that hunting was worse than expected. These findings supported those of Clawson and Knetsch (1966) who observed that perceptions of the value of a recreational experience were strongly influenced by expectations.

Table 8. Responses to questions concerning degree of satisfaction received from hunting wetlands during the 1982 season and hunter satisfaction compared to expectations by resident South Dakota hunters.

Response Category	N	Response in Percent
Degree of satisfaction received from hunting		
Extremely satisfying	240	34
Moderately satisfying	309	44
Somewhat satisfying	103	15
Dissatisfied	46	7
No response	7	<1
Hunting in 1982 compared to expectations		
Better than expected	180	26
About as expected	387	55
Worse than expected	131	19
No response	7	<1

CONCLUSIONS

Analysis of questionnaires demonstrated that hunting on wetland habitat was an important aspect of hunting for thousands of South Dakota resident hunters. An estimated 67% of the Basic and Sportsman's Combination license holders hunted wetlands at least once during the 1982 season. The average number of days hunted was 23.88. Over 47% of all wetland related hunting reported in the survey occurred on public wetlands, yet public wetlands constituted only 31% of the resource. This disproportionally high use of public wetlands was indicative of their importance as a recreation resource to resident hunters.

Wetland related hunting expenditures contributed substantially to the recreation economy of South Dakota. Hunting on wetland habitat during 1982 generated an estimated $24,127,265 in expenditures. Hunter expenditures are an indication of the secondary monetary benefits that accrue to the business community and can be attributed to the wetland resource. The estimated 1982 wetland related hunting expenditures reported in this study would have accounted for 36% of all 1980 hunting expenditures in South Dakota. Approximately 43% of all wetland related hunting expenditures were associated with the use of public wetlands.

The total consumers' surplus value for hunters that

hunted wetlands in 1982 was estimated at $33,886,411, and is a measure of benefits received by resident hunters in excess of costs paid. This value can also be attributed to the wetland resource and when discounted at the social discount rate can be compared with agricultural use of drained wetlands. In the Central and West River regions the recreational value of both public and private wetlands used for hunting combined and considered separately was higher than that of drained wetlands used for agricultural purpose. However, the recreational value of public and private wetlands combined and of private wetlands, considered separately, were lower than agricultural values in the Eastern region. The estimates provided in this study form a basis for South Dakota resource managers to demonstrate that the use of wetlands for hunting makes a substantial contribution to the economy of the state.

The estimated willingness-to-sell value for public wetlands was $53,872,263 which converts to a price of $4,047 per hectare for the privilege to hunt on public wetlands during the 1983 season. Although the majority of public wetland users were urban residents there was no significant difference in willingness-to-sell values between urban and rural residents, this suggested that public wetlands were equally important to all segments of the hunter population. Furthermore, hunter use of public wetlands may increase in the immediate future given the projected increase in

population and the rural to urban migration pattern.

Hunting by resident sportsmen represents only one of the recreational uses of South Dakota wetland resources. Alternative uses which yield direct and measurable economic benefits include hunting by non-residents, trapping, fishing, canoeing, photography, hiking, nature study, cross country skiing, camping, and picnicking. To the extent that these uses are non-competitive, the consumers' surplus each generated is additive, thus increasing the value of wetlands. The total recreational value of South Dakota wetlands awaits further research and valuation estimates of these recreational activities.

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APPENDIX

APPENDIX A

South Dakota Cooperative
Wildlife Research Unit

Dept. of Wildlife & Fisheries Sciences,
P.O. Box 2207
South Dakota State University
Brookings, South Dakota 57007
(605) 688-6121

Cooperating Agencies:

South Dakota Department Of
Game, Fish and Parks
South Dakota State University
Wildlife Management Institute
U.S. Fish and Wildlife Service

7 March 1983

Dear Sportsman:

The value of wetlands as reproduction and wintering habitat for many species of wildlife is well known. However, we don't know the value of South Dakota's wetlands to you, the hunter.

We need your help! The South Dakota Cooperative Wildlife Research Unit is engaged in a comprehensive study of the value of wetlands. Determining the value of wetlands to you, the sportsman, is an important aspect of this study. You have been chosen through a random selection process to receive our questionnaire.

Only you can give us the answers we need. Will you please help by filling out the accompanying questionnaire and returning it in the self addressed envelope. It probably will take 15 or 20 minutes of your time. Your answers will be held confidential and will be pooled with those of other sportsmen for statistical use only. If you did not hunt during the 1982 season please check the line below and return the unanswered questionnaire.

Your response is important! Please complete the questionnaire as soon as possible after you receive it. Your response will contribute to the broad base of information necessary for South Dakota game managers to effectively manage our wetland resources and meet your hunting needs.

The numbers of all returned questionnaires will be removed and a drawing from these numbers made for a Remington 870 12 gauge shotgun which will be given to the respondent whose number is drawn.

Thank you in advance for your cooperation.

Sincerely,

Craig W. Johnson

Craig W. Johnson
Research Assistant

CWJ/aam

Enclosure

_____ I did not hunt during the 1982 season.

South Dakota Cooperative
Wildlife Research Unit

Dept. of Wildlife & Fisheries Sciences,
P.O. Box 2207
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(605) 688-6121

Cooperating Agencies:

South Dakota Department Of
Game, Fish and Parks
South Dakota State University
Wildlife Management Institute
U.S. Fish and Wildlife Service

26 April 1983

Dear Sportsman:

Fill out the enclosed questionnaire and have a chance to win a Remington Model 870 shotgun.

About a month ago you were sent a questionnaire. To date we have not received your response. Please take a few minutes and fill out the questionnaire. Only you can provide the answers we need to more effectively manage your wildlife resources.

If you have filled out the questionnaire since this mailing, please disregard this notice.

Thank you for your cooperation.

Sincerely,

Craig W. Johnson

Craig W. Johnson
Graduate Research Assistant

am

Enclosures

QUESTIONNAIRE

Please answer all the questions except as noted. If you don't understand an item explain your answer with a comment in the margin.

Definitions:

The terms public wetlands and private wetlands will be used in the questionnaire and are defined here as:

Public wetlands, all Waterfowl Production Areas. W.P.A.s; Game Production Areas, G.P.A.s; meandered lakes, and portions of National Wildlife Refuges open to public hunting. Examples are shown in the photographs below.

Private wetlands, all wetlands and adjacent habitat similar to those illustrated in the three photographs below; also stock dams, creek bottoms, and river bottoms on private property.

GPA *WPA* *MEANDERED LAKE*

1. Number of years you have hunted at least once:

_____

2. Please rank your preference for hunting the species listed below. Rank your first preference as number 1. Second preference as number 2, etc. Rank only those species you hunted in 1982.

_____ Waterfowl: Ducks - Geese
_____ Upland game: Pheasants - Gray partridge - Cottontail rabbits
_____ Big game: White-tailed deer
_____ Predators: Fox - Coyote

3. Compared to all other forms of outdoor recreation hunting is . . . . . (check one)

_____ of little importance
_____ moderately important
_____ extremely important

4. My interest in hunting in the past five years has . . . . . (check one)

_____ increased
_____ remained about the same
_____ decreased

5. Hunting in 1982 compared to my expectations was actually . . . . . (check one)

_____ better than I expected
_____ about as I expected
_____ worse than expected

6. The degree of satisfaction I received from hunting during 1982 was . . . . . (check one)

_____ extremely satisfying
_____ moderately satisfying
_____ somewhat satisfying
_____ I was dissatisfied

7. Please rank the hunting experience attributes listed below in their order of importance to you. Rank the most important attribute as number 1, second preference number 2, etc.

_____ Watching wildlife
_____ Bagging game
_____ Companionship
_____ Outsmarting game
_____ Making a difficult shot
_____ Hunting with friends/relatives
_____ Just being outdoors
_____ Getting my limit

8. How many different days did you engage in the following types of hunting on public wetlands during the 1982 season and what was your success? If you did not hunt on public wetlands check the space at the end of this question and proceed to question number 11.

Species	Number of Days Hunted	Approximate Total Number Bagged
Waterfowl	_____	_____
Ducks		
Geese		
Upland Game	_____	_____
Doves		
Pheasants		
Gray partridge		
Cottontail rabbits		
Big Game	_____	_____
Deer		
Other Game	_____	_____
Predators		

_____ I did not hunt on public wetlands in 1982.

9. What was the average number of hours you hunted on public wetlands each day?

_____

10. Suppose you have the right to hunt all the species you hunted last season on public wetlands just as you have in the past. But also suppose you could sell your priviledge to hunt on public wetlands for a season. If you did sell that priviledge, you yourself could not hunt on public wetlands during that season. You could hunt the species you hunted last year but only in upland habitats such as grain fields or on private wetlands. Obtaining permission to hunt on private property would be your responsibility just as it is now. You set the price and the choice would be entirely up to you whether or not you sold this right.

We emphasize that this situation is entirely fictitious - no one is going to restrict hunting on public wetlands on the basis of this questionnaire and no one could actually buy or sell this priviledge.

BUT, WHAT IS THE SMALLEST AMOUNT YOU THINK YOU WOULD TAKE TO GIVE UP YOUR PRIVILEDGE TO HUNT THE SPECIES YOU HUNTED LAST YEAR ON PUBLIC WETLANDS FOR A SEASON, SAY, 1983?

_____ $ 0.00 - $ 2.49
_____ 2.50 - 4.99
_____ 5.00 - 9.99
_____ 10.00 - 19.99
_____ 20.00 - 29.99
_____ 30.00 - 49.99
_____ 50.00 - 74.99
_____ 75.00 - 99.99
_____ 100.00 - 199.00
_____ 200.00 - 299.00
_____ 300.00 - 399.00
_____ 400.00 - 499.00
_____ 500.00 - 749.00
_____ 750.00 - 1000.00
_____ over 1000
_____ specify

11. How many different days did you engage in the following types of hunting on private wetlands during the 1982 season and what was your success? If you did not hunt on private wetlands check the space at the end of this question and proceed to question number 14.

Species	Number of Days Hunted	Approximate Total Number Bagged
Waterfowl		
Ducks	_____	_____
Geese		
Upland Game		
Doves	_____	_____
Pheasants		
Gray partridge		
Cottontail rabbits		
Big Game		
Deer	_____	_____
Other Game		
Predators	_____	_____

_____ I did not hunt on private wetlands in 1982.

12. What arrangements did you make to hunt on private wetlands?

_____ 1. Seasonal blind rental
_____ 2. Seasonal wetland rental
_____ 3. Daily wetland rental
_____ 4. Free hunting by permission
_____ 5. I hunted on my own land

13. If a rental fee was charge how much did you pay in fees for the 1982 season?

_____

14. About how much do you figure your total wetland related hunting costs were for the 1982 season? (An obvious cost would be shotgun shells.) We are interested in what you consider your costs to be. We therefore prefer not specifying cost categories. After you have given the questions a little thought, please check the answer which you feel best represents your total costs for the season.

_____	$ 0.00 - $ 2.49	_____	100.00 - 199.00
_____	2.50 - 4.99	_____	200.00 - 299.00
_____	5.00 - 9.99	_____	300.00 - 399.00
_____	10.00 - 19.99	_____	400.00 - 499.00
_____	20.00 - 29.99	_____	500.00 - 749.00
_____	30.00 - 49.99	_____	750.00 - 1000.00
_____	50.00 - 74.99	_____	over 1000
_____	75.00 - 99.99	_____	specify

15. What percentage of those costs would you estimate were spent related to hunting on:

_____ % public wetlands _____ % private wetlands = 100%

16. Have you taken any days off without pay to hunt on wetlands, not including vacations or holidays? If so how many:

_____ days without pay

17. Since we have been talking about costs, we would like to ask you another question on the same subject, but this one again involves an entirely fictitious situation. Again the question may take some thought, but we would like your best guess.

Suppose that the costs for hunting the species you hunted on wetlands during the 1982 season were greater than your estimate in question 14. Assume these increased costs in no way reflected general hunting conditions. About <u>how much greater</u> do you think your costs would have had to have been before you would have decided not to have gone hunting on public or private wetlands at all during that season?

Please check the answer below that you consider most appropriate.

_____ $ 0.00 - $ 2.49
_____ 2.50 - 4.99
_____ 5.00 - 9.99
_____ 10.00 - 19.99
_____ 20.00 - 29.99
_____ 30.00 - 49.99
_____ 50.00 - 74.99
_____ 75.00 - 99.99
_____ 100.00 - 199.00
_____ 200.00 - 299.00
_____ 300.00 - 399.00
_____ 400.00 - 499.00
_____ 500.00 - 749.00
_____ 750.00 - 1000.00
_____ over 1000
specify

18. Please check below the size of the wetland habitat that you hunted most frequently during the 1982 season.

_____ 0 - 10 acres
_____ 20 - 50 acres
_____ 50 - 100 acres
_____ over 100 acres

The following demographic information is needed to compare with other answers to determine hunter characteristics.

19. What county do you live in?

_____

20. What county did you do most of your wetland related hunting in?

_____

21. Age at last birthday:

_____ 15-20
_____ 21-30
_____ 31-40
_____ 41-50
_____ 50+

22. Age when you first hunted:

_____ 10-15
_____ 16-21
_____ 22-26
_____ 27-32
_____ 33-38
_____ 39+

23. Sex:

_____ Male
_____ Female

24. Where did you spend most of your youth?

_____ City of 2,500 or above
_____ Small town under 2,500
_____ In the country but not as part of a farming operation
_____ In the country as part of a farming operation

25. Where do you live now?

_____ City of 2,500 or above
_____ Small town under 2,500
_____ In the country but not as part of a farming operation
_____ In the country as part of a farming operation

26. Check the highest year of school you have completed.

_____ Completed grade school
_____ Some high school
_____ Completed high school
_____ Some college
_____ Completed college
_____ Graduate work

27. Check the category that approximates your total family income after taxes.

_____ $ 0 - 4,999
_____ 5,000 - 9,999
_____ 10,000 - 14,999
_____ 15,000 - 19,999
_____ 20,000 - 24,999
_____ 25,000 - 29,999
_____ 30,000 - 34,999
_____ 35,000 +

28. Please write in the space below any additional comments you may have concerning the value of wetlands to your hunting experience.

----------cut----------

Questionnaire #_____ - This number will be used in drawing for the shotgun. The number will be removed from the questionnaire so your response will remain anonymous.