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# New Zealand Agricultural and Resource Economics Society (Inc.)

## **U.S. Outdoor Recreation Use Values: A Benefit Transfer Study**

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# U.S. Outdoor Recreation Use Values: A Benefit Transfer Study

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## Abstract

Past empirical benefit measures and other information originally obtained through primary data collection can be used for assessing and analyzing current management and policy actions. This use of past valuation information for current policy analysis is called benefit transfer. In this report, we present information from our database of 1239 consumer surplus estimates usable for benefit transfer that we created from our extensive literature review. The outdoor recreation use value database spans from 1967 through 2003 with activities ranging from birdwatching and picnicking to rock climbing and snorkeling.

A park manager or other planner could easily use the information from our database to estimate consumer surplus values for a park, region, or activity, separately, or in combination. For instance, consumer surplus per person per day for wildlife viewing is US\$35.30. However, if you are interested in a specific area, such as Alaska, you would find that the consumer surplus for wildlife viewing is US\$41.11. Here, we see that the wildlife value in Alaska is higher than the overall average of wildlife viewing, which may be due to the fact that many people go to Alaska to see the big five: wolves, brown bears, dall sheep, caribou, and moose. Databases such as these provide a vast amount of valuable information and can easily be used by a wide range of audiences, from academics to land managers to politicians.

## **INTRODUCTION**

Several United States federal agencies including the National Park Service, U.S. Fish and Wildlife Service, Bureau of Reclamation and the USDA Forest Service require information on recreation values to feed directly into a need for credible measures of benefits. In this case, we are interested in developing credible measures of benefits for outdoor recreation. This goal is accomplished firstly by providing information from a literature review of United States outdoor recreation use value economic studies spanning 1967 to 2003. And secondly, by providing some basic guidelines to perform benefit transfers in the context of recreation use valuation. Therefore, we are not presenting a cookbook for benefit transfers, but instead we are presenting a guide to the empirical estimates available.<sup>1</sup>

## **DATA**

### **Literature Review Efforts, Past and Present**

We provide data on outdoor recreation use values based on empirical research conducted from 1967 to 2003 in the United States. This data is the compilation of five literature reviews conducted over the last twenty years. The first four reviews covered the outdoor recreation value estimation literature from the mid-1960s through 1998 (Sorg and Loomis 1984; Walsh et al 1988; MacNair 1993; Rosenberger and Loomis 2001). We then combine the data from the previous literature reviews and combine it with our literature review, covering new studies from 1998 through 2003. In this new review, we were able to obtain 479 new observations.

New data were combined with old data to create a database of 1239 observations spanning 1967 through 2003. Table 1 presents data separated by the 30 activities reported. Information that can be observed includes the number of studies, number of estimates, mean, standard error, standard deviation, and range of values. In brief, the activities most commonly found include hunting, fishing, wildlife viewing, and camping. Values are in 1996 US\$ and range from a low of US\$.33/per person/per day for hiking to US\$464.02/per person/ per day for fishing. The average estimate of consumer surplus is US\$39.70/ per person/ per day across all 1239 observations.

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<sup>1</sup> A more complete discussion of benefit transfer protocols can be found in Rosenberger and Loomis, 2001

**Table 1. Summary Statistics on Average Consumer Surplus Values by Activity per person per day from Recreation Benefit Studies 1967-2003 (US\$1996 dollars)**

Activity	Number of Studies	Number of Estimates	Mean	Std. Error	Range of Estimates	
Backpacking	1	6	\$43.42	\$7.74	\$22.35	\$66.95
Birdwatching	4	8	\$24.67	\$6.96	\$4.83	\$65.38
Camping	29	48	\$30.99	\$4.81	\$1.69	\$187.11
Cross Country Skiing	8	12	\$26.15	\$2.84	\$11.71	\$40.32
Downhill Skiing	5	5	\$27.91	\$7.07	\$12.54	\$52.59
Fishing	129	177	\$39.30	\$4.01	\$1.73	\$464.02
Floatboating/ Rafting/ Canoeing	20	81	\$84.09	\$7.97	\$2.25	\$329.02
General Recreation	15	39	\$29.25	\$7.24	\$1.18	\$214.59
Going to the Beach	5	33	\$32.86	\$4.22	\$3.15	\$98.18
Hiking	21	68	\$25.70	\$3.61	\$0.33	\$218.37
Horseback Riding	1	1	\$15.10		\$15.10	\$15.10
Hunting	192	277	\$39.10	\$1.83	\$2.17	\$209.08
Motorboating	15	32	\$38.56	\$6.19	\$3.15	\$169.68
Mountain Biking	7	32	\$61.48	\$10.09	\$17.38	\$246.41
Off Road Vehicle Driving	4	10	\$19.10	\$3.29	\$4.37	\$34.05
Other Recreation	15	16	\$40.58	\$9.64	\$4.76	\$172.35
Picnicking	8	13	\$34.55	\$8.91	\$7.45	\$118.95
Pleasure Driving (which may include sightseeing)	4	11	\$49.36	\$15.70	\$2.52	\$139.78
Rockclimbing	4	27	\$46.88	\$5.72	\$22.18	\$113.18
Scuba Diving	2	24	\$26.97	\$9.34	\$2.34	\$208.37
Sightseeing	15	28	\$30.70	\$7.33	\$0.54	\$174.81
Snorkeling	1	9	\$25.26	\$12.80	\$4.36	\$112.74
Snowmobiling	3	8	\$30.24	\$11.03	\$8.99	\$103.70
Swimming	11	26	\$35.57	\$5.12	\$1.83	\$111.95
Visit Environmental Education Center	1	1	\$5.01		\$5.01	\$5.01
Visiting an Arboretum	1	1	\$11.28		\$11.28	\$11.28
Visiting Aquariums	1	1	\$23.59		\$23.59	\$23.59
Waterskiing	1	4	\$40.85	\$10.60	\$12.61	\$58.39
Wildlife Viewing	69	240	\$35.30	\$2.20	\$2.00	\$289.90
Windsurfing	1	1	\$329.56		\$329.56	\$329.56

Table 2 breaks down the information further by subdividing the activities by region. Six regions are used that roughly follow U.S. Census Regions: Alaska, Intermountain, Northeast, Pacific Coast, Southeast, and our own construct, Multiple Area. Multiple Area was included as several of the studies spanned more than one region. Here we find 354 observations in the Intermountain area, 306 in the Northeast, 281 in the Southeast, 186 in the Pacific Coast, 26 in Alaska and only 86 in the Multiple area studies.

**Table 2. Summary Statistics on Average Consumer Surplus Values by Activity and Region per person per day 1967-2003 (1996 US\$)**

Activity	Alaska		Intermountain		Multiple Area Studies		Northeast		Pacific Coast		Southeast	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Backpacking									6	\$43.42		
Birdwatching							3	\$29.05			5	\$22.05
Camping			21	\$28.93	2	\$9.85	10	\$27.59	4	\$86.96	11	\$21.49
Cross Country Skiing			7	\$24.90	1	\$12.67	3	\$28.83	1	\$40.32		
Downhill Skiing			3	\$33.02	1	\$19.61			1	\$20.90		
Fishing	4	\$51.66	48	\$41.31	14	\$39.61	69	\$27.17	15	\$36.97	27	\$66.01
Floatboating/ Rafting/ Canoeing	1	\$15.13	22	\$56.42	1	\$28.34	6	\$73.60	4	\$23.20	47	\$106.22
General Recreation	1	\$12.37	12	\$40.38	3	\$3.33	5	\$14.06	9	\$26.96	9	\$35.64
Going to the Beach							22	\$35.50			11	\$27.60
Hiking	1	\$12.93	7	\$32.11	1	\$20.87	3	\$62.65	49	\$19.37	7	\$50.32
Horseback Riding					1	\$15.10						
Hunting	7	\$54.73	109	\$40.46	12	\$51.41	87	\$39.54	18	\$37.91	44	\$29.47
Motorboating			7	\$44.73	1	\$28.63	3	\$24.73	8	\$22.45	13	\$49.10
Mountain Biking			6	\$153.73	1	\$17.61	1	\$34.11	16	\$41.40	8	\$41.35
Off Road Vehicle Driving			7	\$19.01	1	\$19.94			1	\$33.64	1	\$4.37
Other Recreation			10	\$46.96	1	\$17.36			1	\$62.06	4	\$25.06
Picnicking			5	\$23.56	1	\$15.69	2	\$47.04	3	\$53.52	2	\$30.52
Pleasure Driving	3	\$7.01	4	\$58.12	1	\$30.38	1	\$17.79			2	\$120.65
Rockclimbing			3	\$42.04	12	\$22.35	1	\$85.74			11	\$71.42
Scuba Diving							14	\$14.93	10	\$43.83		
Sightseeing	1	\$13.20	11	\$19.65	1	\$14.86	2	\$101.19	4	\$16.89	9	\$38.38
Snorkeling									9	\$25.26		
Snowmobiling			8	\$30.24								
Swimming			1	\$24.62	1	\$19.63	7	\$18.51	4	\$22.74	13	\$50.77
Visit Env. Education Center							1	\$5.01				
Visiting Arboretum											1	\$11.28
Visiting Aquariums											1	\$23.59
Waterskiing			2	\$47.47	1	\$55.83	1	\$12.61				
Wildlife Viewing	8	\$41.11	61	\$31.03	29	\$46.97	65	\$26.08	23	\$60.40	54	\$33.42
Windsurfing											1	\$329.56
Totals	26	\$38.20	354	\$39.58	86	\$36.61	306	\$32.04	186	\$34.96	281	\$52.42

The original study was sponsored by the USDA Forest Service while this update is sponsored by the National Park Service. Therefore, we included a summary of the various agencies (Table 3). This table categorizes the data according to region and recreation area. Recreation area is subdivided into National Forest, National Park, State or City Land, and Various Land Entities. We also include a separate category that presents the observations that were found in Wilderness areas by region. Overall, 186 observations were in National Forests, 49 in National Parks, 990 in other locations, and 14 spanning various entities. Of the 1239 studies, 108 were found to be in Wilderness areas.

**Table 3. Summary Statistics on Average Per Day Consumer Surplus Values by Public Land Type and Wilderness—1967 to 2003 (1996 US\$)**

Recreation Area	Alaska		Intermountain		Multiple Area Studies		Northeast		Pacific Coast		Southeast		Totals	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Various Entities					12	\$22.35			2	\$29.72			All	
National Forest	3	\$11.49	40	\$21.65	9	\$18.69	34	\$25.76	53	\$18.98	47	\$96.40	186	\$40.22
National Park	3	\$7.01	29	\$33.90					11	\$89.21	6	\$22.36	49	\$43.26
State or City Land	20	\$46.89	285	\$42.67	65	\$41.72	272	\$32.83	120	\$37.13	228	\$44.15	990	\$39.66
Wilderness Recreation			32	\$34.73	17	\$23.72	8	\$21.23	46	\$21.85	5	\$98.89	108	\$29.48



We then further subdivide our results by activity and region. These results are presented in Table 4. The region with the least amount of activities was Alaska with nine. This does not mean that only nine activities can be participated in while visiting Alaska, but that we only found consumer surplus studies for nine. None of the regions encompassed all 30 activities, however, the Northeast, Southeast, and Multiple area studies represented 21 of the 30 activities.

**Table 4 Detailed Descriptive Statistics on Average Per Day Consumer Surplus Values by Activity and Region - 1967 to 2003 (1996 US\$)**

Region	Activity	N	Mean	Std. Error	Std. Dev	Min	Max
<b>Alaska Region</b>							
	Fishing	4	\$51.66	\$7.68	\$15.36	\$38.00	\$68.28
	Floatboating/ Rafting/ Canoeing	1	\$15.13			\$15.13	\$15.13
	General Recreation	1	\$12.37			\$12.37	\$12.37
	Hiking	1	\$12.93			\$12.93	\$12.93
	Hunting	7	\$54.73	\$4.01	\$10.61	\$39.22	\$71.21
	Pleasure Driving	3	\$7.01	\$3.06	\$5.30	\$2.52	\$12.86
	Sightseeing	1	\$13.20			\$13.20	\$13.20
	Wildlife Viewing	8	\$41.11	\$7.91	\$22.38	\$8.91	\$70.33
<b>Alaska Region Total</b>		<b>26</b>	<b>\$38.20</b>	<b>\$4.48</b>	<b>\$22.83</b>	<b>\$2.52</b>	<b>\$71.21</b>
<b>Intermountain Area Studies</b>							
	Camping	21	\$28.93	\$5.53	\$25.36	\$1.69	\$97.22
	Cross Country Skiing	7	\$24.90	\$3.82	\$10.11	\$11.71	\$38.74
	Downhill Skiing	3	\$33.02	\$11.57	\$20.04	\$12.54	\$52.59
	Fishing	48	\$41.31	\$5.80	\$40.18	\$7.47	\$189.40
	Floatboating/ Rafting/ Canoeing	22	\$56.42	\$11.94	\$55.98	\$2.25	\$263.68
	General Recreation	12	\$40.38	\$17.43	\$60.39	\$6.59	\$214.59
	Hiking	7	\$32.11	\$6.53	\$17.27	\$10.71	\$63.13
	Hunting	109	\$40.46	\$2.79	\$29.17	\$2.17	\$141.09
	Motorboating	7	\$44.73	\$21.61	\$57.17	\$4.41	\$169.68
	Mountain Biking	6	\$153.73	\$34.21	\$83.79	\$54.90	\$246.41
	Off Road Vehicle Driving	7	\$19.01	\$3.59	\$9.51	\$6.63	\$34.05
	Other Recreation	10	\$46.96	\$14.47	\$45.76	\$10.14	\$172.35
	Picnicking	5	\$23.56	\$3.41	\$7.62	\$11.34	\$32.30
	Pleasure Driving	4	\$58.12	\$27.69	\$55.38	\$22.01	\$139.78
	Rockclimbing	3	\$42.04	\$6.32	\$10.95	\$29.82	\$50.95
	Sightseeing	11	\$19.65	\$7.21	\$23.90	\$0.54	\$83.94
	Snowmobiling	8	\$30.24	\$11.03	\$31.21	\$8.99	\$103.70
	Swimming	1	\$24.62			\$24.62	\$24.62
	Waterskiing	2	\$47.47	\$10.91	\$15.43	\$36.56	\$58.39
	Wildlife Viewing	61	\$31.03	\$2.75	\$21.46	\$4.38	\$161.59
<b>Intermountain Area Studies Total</b>		<b>354</b>	<b>\$39.58</b>	<b>\$2.04</b>	<b>\$38.36</b>	<b>\$0.54</b>	<b>\$263.68</b>
<b>Multiple Area Studies</b>							
	Camping	2	\$9.85	\$1.67	\$2.36	\$8.18	\$11.52
	Cross Country Skiing	1	\$12.67			\$12.67	\$12.67
	Downhill Skiing	1	\$19.61			\$19.61	\$19.61
	Fishing	14	\$39.61	\$8.74	\$32.69	\$2.00	\$105.00
	Floatboating/ Rafting/ Canoeing	1	\$28.34			\$28.34	\$28.34
	General Recreation	3	\$3.33	\$1.69	\$2.93	\$1.64	\$6.71
	Hiking	1	\$20.87			\$20.87	\$20.87
	Horseback Riding	1	\$15.10			\$15.10	\$15.10
	Hunting	12	\$51.41	\$19.21	\$66.55	\$5.00	\$193.82
	Motorboating	1	\$28.63			\$28.63	\$28.63
	Mountain Biking	1	\$17.61			\$17.61	\$17.61
	Off Road Vehicle Driving	1	\$19.94			\$19.94	\$19.94
	Other Recreation	1	\$17.36			\$17.36	\$17.36
	Picnicking	1	\$15.69			\$15.69	\$15.69
	Pleasure Driving	1	\$30.38			\$30.38	\$30.38
	Rockclimbing	12	\$22.35	\$0.03	\$0.10	\$22.18	\$22.43
	Sightseeing	1	\$14.86			\$14.86	\$14.86
	Swimming	1	\$19.63			\$19.63	\$19.63
	Waterskiing	1	\$55.83			\$55.83	\$55.83
	Wildlife Viewing	29	\$46.97	\$10.32	\$55.58	\$2.50	\$261.66
<b>Multiple Area Studies Total</b>		<b>86</b>	<b>\$36.61</b>	<b>\$4.77</b>	<b>\$44.26</b>	<b>\$1.64</b>	<b>\$261.66</b>

	Activity	N	Mean	Std. Error	Std. Dev.	Min	Max
<b>Northeast Area</b>							
	Birdwatching	3	\$29.05	\$18.50	\$32.04	\$4.83	\$65.38
	Camping	10	\$27.59	\$5.27	\$16.66	\$5.61	\$55.37
	Cross Country Skiing	3	\$28.83	\$2.35	\$4.08	\$24.75	\$32.91
	Fishing	69	\$27.17	\$4.55	\$37.76	\$1.73	\$210.94
	Floatboating/ Rafting/ Canoeing	6	\$73.60	\$19.11	\$46.81	\$16.73	\$119.58
	General Recreation	5	\$14.06	\$6.73	\$15.05	\$1.64	\$38.91
	Going to the Beach	22	\$35.50	\$5.86	\$27.48	\$3.15	\$98.18
	Hiking	3	\$62.65	\$10.69	\$18.52	\$41.50	\$75.92
	Hunting	87	\$39.54	\$3.36	\$31.37	\$3.47	\$209.08
	Motorboating	3	\$24.73	\$21.01	\$36.39	\$3.15	\$66.75
	Mountain Biking	1	\$34.11			\$34.11	\$34.11
	Picnicking	2	\$47.04	\$39.59	\$55.98	\$7.45	\$86.63
	Pleasure Driving	1	\$17.79			\$17.79	\$17.79
	Rockclimbing	1	\$85.74			\$85.74	\$85.74
	Scuba Diving	14	\$14.93	\$2.86	\$10.70	\$2.34	\$37.50
	Sightseeing	2	\$101.19	\$73.63	\$104.12	\$27.56	\$174.81
	Swimming	7	\$18.51	\$5.12	\$13.54	\$1.83	\$41.75
	Visit Environmental Ed Center	1	\$5.01			\$5.01	\$5.01
	Waterskiing	1	\$12.61			\$12.61	\$12.61
	Wildlife Viewing	65	\$26.08	\$1.82	\$14.64	\$2.00	\$80.25
<b>Northeast Area Studies Total</b>		<b>306</b>	<b>\$32.04</b>	<b>\$1.77</b>	<b>\$30.91</b>	<b>\$1.64</b>	<b>\$210.94</b>
<b>Pacific Coast Area Studies</b>							
	Backpacking	6	\$43.42	\$7.74	\$18.97	\$22.35	\$66.95
	Camping	4	\$86.96	\$37.82	\$75.63	\$6.21	\$187.11
	Cross Country Skiing	1	\$40.32			\$40.32	\$40.32
	Downhill Skiing	1	\$20.90			\$20.90	\$20.90
	Fishing	15	\$36.97	\$7.23	\$28.02	\$3.69	\$86.25
	Floatboating/ Rafting/ Canoeing	4	\$23.20	\$0.84	\$1.68	\$21.01	\$24.65
	General Recreation	9	\$26.96	\$11.98	\$35.93	\$1.18	\$104.64
	Hiking	49	\$19.37	\$2.21	\$15.47	\$0.33	\$108.02
	Hunting	18	\$37.91	\$6.44	\$27.33	\$5.21	\$92.80
	Motorboating	8	\$22.45	\$4.92	\$13.91	\$10.40	\$53.40
	Mountain Biking	16	\$41.40	\$2.28	\$9.11	\$26.42	\$65.62
	Off Road Vehicle Driving	1	\$33.64			\$33.64	\$33.64
	Other Recreation	1	\$62.06			\$62.06	\$62.06
	Picnicking	3	\$53.52	\$33.05	\$57.25	\$12.66	\$118.95
	Scuba Diving	10	\$43.83	\$21.55	\$68.14	\$4.36	\$208.37
	Sightseeing	4	\$16.89	\$11.26	\$22.53	\$4.36	\$50.64
	Snorkeling	9	\$25.26	\$12.80	\$38.39	\$4.36	\$112.74
	Swimming	4	\$22.74	\$9.46	\$18.91	\$5.05	\$49.08
	Wildlife Viewing	23	\$60.40	\$14.08	\$67.53	\$5.91	\$289.90
<b>Pacific Coast Area Studies Total</b>		<b>186</b>	<b>\$34.96</b>	<b>\$2.84</b>	<b>\$38.69</b>	<b>\$0.33</b>	<b>\$289.90</b>
<b>Southeast Area Studies</b>							
	Birdwatching	5	\$22.05	\$5.34	\$11.93	\$7.87	\$36.06
	Camping	11	\$21.49	\$6.74	\$22.34	\$2.75	\$54.18
	Fishing	27	\$66.01	\$19.71	\$102.43	\$3.00	\$464.02
	Floatboating/ Rafting/ Canoeing	47	\$106.22	\$11.21	\$76.87	\$15.04	\$329.02
	General Recreation	9	\$35.64	\$17.09	\$51.28	\$4.18	\$157.88
	Going to the Beach	11	\$27.60	\$4.80	\$15.91	\$5.66	\$44.86
	Hiking	7	\$50.32	\$28.72	\$75.99	\$1.56	\$218.37
	Hunting	44	\$29.47	\$2.38	\$15.78	\$4.74	\$69.00
	Motorboating	13	\$49.10	\$7.99	\$28.81	\$5.76	\$111.95
	Mountain Biking	8	\$41.35	\$4.49	\$12.71	\$17.38	\$56.27
	Off Road Vehicle Driving	1	\$4.37			\$4.37	\$4.37
	Other Recreation	4	\$25.06	\$9.44	\$18.87	\$4.76	\$47.66
	Picnicking	2	\$30.52	\$6.72	\$9.50	\$23.80	\$37.24
	Pleasure Driving	2	\$120.65	\$18.10	\$25.59	\$102.55	\$138.74
	Rockclimbing	11	\$71.42	\$8.15	\$27.04	\$32.73	\$113.18
	Sightseeing	9	\$38.38	\$11.42	\$34.26	\$6.60	\$93.92
	Swimming	13	\$50.77	\$7.50	\$27.05	\$11.37	\$111.95
	Visiting an Arboretum	1	\$11.28			\$11.28	\$11.28
	Visiting Aquariums	1	\$23.59			\$23.59	\$23.59
	Wildlife Viewing	54	\$33.42	\$2.67	\$19.66	\$2.38	\$111.95
	Windsurfing	1	\$329.56			\$329.56	\$329.56
<b>Southeast Area Studies Total</b>		<b>281</b>	<b>\$52.42</b>	<b>\$3.54</b>	<b>\$59.40</b>	<b>\$1.56</b>	<b>\$464.02</b>

## **DETAILS OF SPREADSHEET DATABASE STUDY CODING.**

Often times in performing benefit transfer, it is more appropriate to compute an average value per visitor day just using empirical studies that closely match the policy site, rather than just using an overall average for the region. In order to facilitate doing this, the spreadsheet contains numerous details about each of the studies.

Details of the recreation site include, in part, its geographic location, whether it was on public or private land, the type of public land (e.g., National Park, National Forest, State Park, State Forest), the state, the USDA Forest Service Region, and land type (e.g., lake, forest, wetland, grassland, river). In many cases, specific details about the recreation site were not provided either because of incomplete reporting or the activity was not linked with a specific site. Details of the user population characteristics include, in part, average age, average income, average education, and proportion female.

Methodology details include survey mode (e.g., mail, telephone, in-person, use of secondary data), response rate for primary data collection studies, and sample frame (e.g., onsite users, general population). Methodology details are further divided between the application of revealed preference (RP) and stated preference (SP) modeling when appropriate. Details of RP modeling include, in part, identifying the model type (e.g., individual travel cost, zonal travel cost, random utility models), use of travel time or substitute sites in the model specification, and functional form (double log, linear, semi-log, log-linear). Details of SP modeling include, in part, identifying the model type (e.g., conjoint analysis, contingent valuation models), the elicitation technique for contingent valuation models (e.g., open ended, dichotomous choice, iterative bidding, payment card), and functional form.

The details of each study were coded to the extent that they could be gleaned from the research-reporting venue. However, not every study could be fully coded according to the coding sheet. This was either because information was not reported or was not collected for a study. For example, coding each study for user characteristics was severely restricted in that very few of the studies in the literature review reported any details about the user population. This and other factors are indicative of the lack of consistent and complete data reporting, which further limits the ability to perform critical benefit transfers.

## **BENEFIT TRANSFER USING TABLES AND DATABASE**

### **What Is a Benefit Transfer?**

Benefit transfer is a term referring to the use of existing value information to new sites or areas. Thus, benefit transfer is the adaptation and use of net WTP or value per day information derived from a specific site(s) under certain resource and policy conditions to a site with similar resources and conditions. The site with data is typically called the ‘study’ site, while the site to which data are transferred is called the ‘policy’ site. Benefit transfer is a practical way to evaluate management and policy impacts when primary research is not possible or justified because of:

- budget constraints,
- time limitations, or
- resource impacts that are expected to be low or insignificant.

Primary research is the ‘first-best’ strategy in which information is gathered that is specific to the action being evaluated, including the spatial and temporal dimensions, expected impacts, and the extent and inclusion of affected human populations and environmental resources. However, when primary research is not possible or plausible, then benefit transfer, as a ‘second-best’ strategy, is important to evaluating management and policy impacts. The worst strategy is not to account for recreation values, thus implying recreation has zero value in an evaluation or assessment model.

### **Conditions for Performing Benefit Transfers**

Several necessary conditions should be met in order to perform effective and efficient benefit transfers (Desvousges and others 1992). First, the policy context should be thoroughly defined, including:

- Identifying the extent, magnitude, and quantification of expected site or resource impacts from the proposed action.
- Identifying the extent and magnitude of the population that will be affected by the expected site or resource impacts.
- Identifying the data needs of an assessment or analysis, including the type of measure (unit, average, marginal value), the kind of value (use, nonuse, or total value), and the degree of certainty surrounding the transferred data (i.e., the accuracy and precision of the transferred data).

Second, the study site data should meet certain conditions for critical benefit transfers:

- Studies transferred must be based on adequate data, sound economic method, and correct empirical technique (Freeman 1984).
- The study contains information on the statistical relationship between benefits (costs) and socioeconomic characteristics of the affected population.
- The study contains information on the statistical relationship between the benefits (costs) and physical/environmental characteristics of the study site.
- An adequate number of individual studies on a recreation activity for similar sites have been conducted in order to enable credible statistical inferences concerning the applicability of the transferred value(s) to the policy site.

And third, the correspondence between the study site and the policy site should exhibit the following characteristics.

- The environmental resource and the change in the quality (quantity) of the resource at the study site and the resource and expected change in the resource at the policy site should be similar. This similarity includes the quantifiability of the change and possibly the source of that change.
- The markets for the study site and the policy site are similar, unless there is enough usable information provided by the study on own and substitute prices. Other characteristics should be considered, including similarity of demographic profiles between the two populations and their cultural aspects.
- The conditions and quality of the recreation activity experiences (e.g., intensity, duration, and skill requirements) are similar between the study site and the policy site.

Most primary research was not conducted for future benefit transfer applications. The information requirements expressed in the above conditions are not always met in the reporting of data and results from primary research. In addition to weighing the benefits of more information from expensive primary research, the implicit cost of performing benefit transfers under conditions of incomplete information should be accounted for. Therefore, benefit transfer practitioners are required to be pragmatic in their applications of the method when considering the many limitations imposed upon them by primary research.

## **Potential Limitations of Benefit Transfers**

Several factors can be identified that affect the reliability and validity of benefit transfers. A related effect that interacts with the following factors is the benefit transfer practitioner's judgment concerning empirical studies, including how to code the data reported by each study. One group of factors affect benefit transfers generally.

- The quality of the original study greatly affects the quality of the benefit transfer process.
- Some recreation activities have a limited number of studies investigating their economic value, thus restricting the pool of estimates and studies from which to draw information.
- Another data limitation is the documentation of data collected and reported. This increases the difficulty of demand estimation and benefit transfer.
- As we have already noted, most primary research is not designed for benefit transfer purposes.

A second group of factors is related to methodological issues.

- Different research methods may have been used across study sites for a specific recreation activity, including what question(s) was asked, how it was asked, what was affected by the management or policy action, how the environmental impacts were measured, and how these impacts affect recreation use.
- Different statistical methods for estimating models can lead to large differences in values estimated. This also includes issues such as the overall impact of model mis-specification and choice of functional form (Adamowicz and others 1989).
- Substitution in recreation demand is an important element when determining the potential impacts of resource changes. However, there is often a lack of data collection and or reporting on the availability of substitute sites, substitute site prices, and the substitution relationship across sites and amongst activities.
- There are different types of values that may have been measured in primary research, including use values and/or passive- or non-use values. While we focus on use values, the benefit transfer practitioner should be aware of what is being measured in original research.

A third group of factors affecting benefit transfers is the correspondence between the study site and the policy site.

- Some of the existing studies may be based on valuing recreation activities at unique sites and under unique conditions.
- Characteristics of the study site and the policy site may be substantially different, leading to quite distinct values. This can include differences in quality changes, site quality, and site location.

A fourth factor is the issue of temporality or stability of data over time. The existing studies occurred at different points in time. The relevant differences between then and now may not be identifiable nor measurable based on the available data. A fifth factor is the spatial dimension between the study site and the policy site. This includes the extent of the implied market, both for the extent and comparability of the affected populations and the resources impacted, between the study site and the policy site.

The above listed factors can lead to bias or error in and restrict the robustness of the benefit transfer process. An overriding objective of the benefit transfer process is to minimize mean square error between the ‘true’ value and the ‘tailored’ or transferred value of impacts at the policy site. However, the original or ‘true’ values are themselves approximations and are therefore subject to error. As such, any information transferred from a study site to a policy site is accomplished with varying degrees of confidence in the applicability and precision of the information. Therefore, National Park decision-making involving trade-offs between types of recreation (motorized vs. non-motorized), and nature preservation. Evaluation of these trade-offs can often be improved by inclusion of even approximate estimates of non-market recreation values. Complete omission of recreation value estimates in economic analytic aids to decision making implies a zero value for recreation, in which case the error of omission can be greater than the error of commission in benefit transfers procedures.

### **Validity and Reliability of Benefit Transfers**

Several recent studies have tested the convergent validity and reliability of different benefit transfer methods (Loomis and others 1995; Downing and Ozuna 1996; Kirchhoff and others 1997; Desvousges and others 1998; Rosenberger and Loomis 2000). The methods tested, which we will presently discuss, include



single point estimate, average value, demand function, and meta regression analysis transfers. While the above studies show that some of the methods are relatively more valid and reliable than other methods, the general indication is that benefit transfer cannot replace original research, especially when the costs of being wrong are high. In some tests of the benefit transfer methods, several cases produced ‘tailored’ values very similar to the ‘true’ values (as low as a few percentage points difference). In other cases, the disparity between the ‘true’ value and the ‘tailored’ value was quite large (in excess of 800 percent difference). Therefore, the policy context and process will most often dictate the acceptability of transferred data.

### **A Note on Definition of Benefit Measures and Use in Policy Analyses**

All of the benefit estimates we provide either recorded from the literature review or ‘forecasted’ by adapting benefit functions, are average consumer surplus per person per activity day. In the case of a single study, the estimate is the average consumer surplus for the average individual in the study. In the case of several studies, the estimate is the average of the study samples’ average consumer surpluses from all included studies.

Consumer surplus is the value of a recreation activity beyond what must be paid to enjoy it.<sup>2</sup> When the change in recreation supply or days is small and localized, consumer surplus is equivalent to a ‘virtual’ market price for a recreation activity (Rosenthal and Brown 1985). A general assumption when applying the benefit estimates is that the estimates are constant across all levels of resource impacts and perceived changes for an individual. This assumption may be plausible for small changes in visitation, but it may be unrealistic for large changes (Morey 1994). However, this assumption is necessary for the practical application of benefit transfers.

Simply stated, the benefit transfer estimate of a management or policy-induced change in recreation is the average consumer surplus estimate for the average individual from the literature aggregated to the change in use of the natural resource. The change in recreational use of a resource may be induced either through a price change in participating in an activity (e.g., fee change or location of the site) or through a quality change in the recreation site.

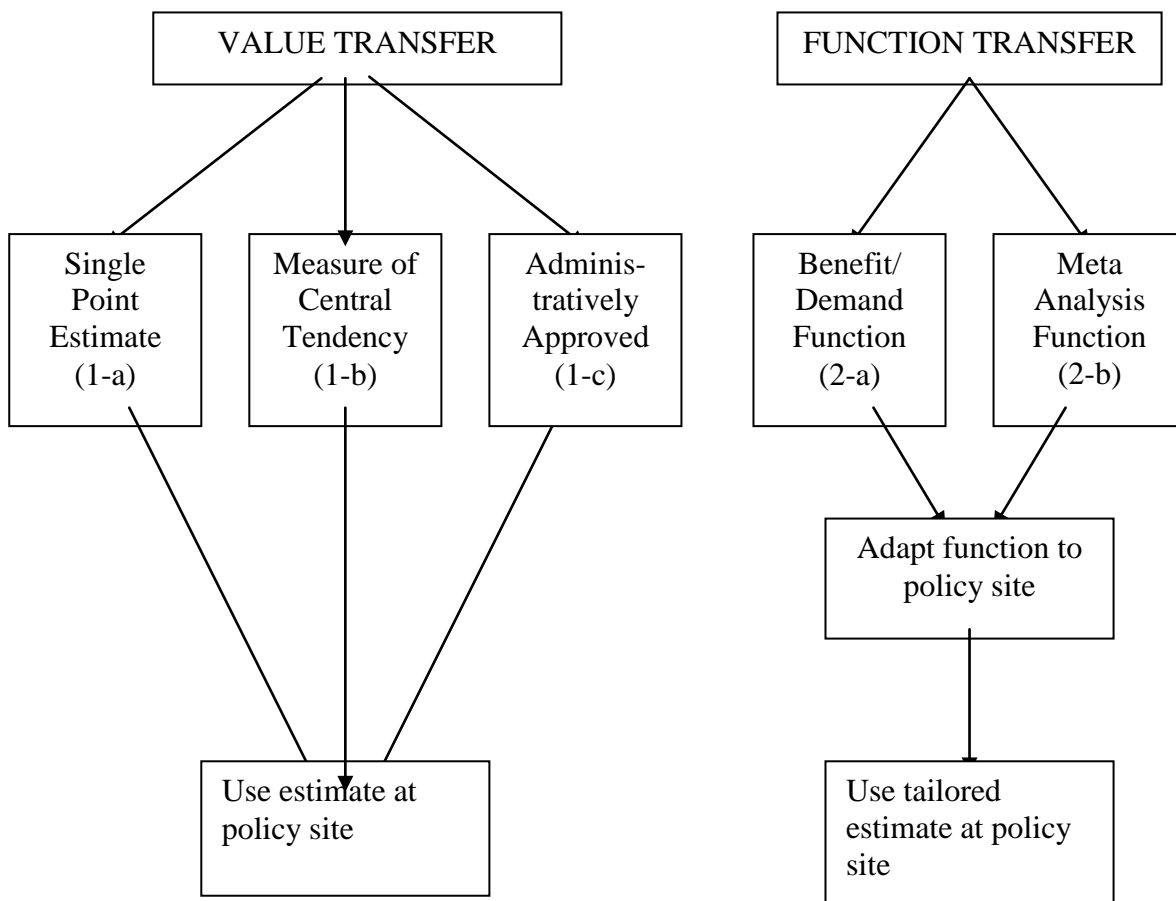
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<sup>2</sup> There are two prominent types of consumer surplus estimated using slightly different definitions of the demand function: Marshallian consumer surplus based on an ordinary demand function, and Hicksian surplus based on either a compensated demand function or elicited directly using hypothetical market techniques. The difference between these measures is due to the income effect (Willig 1976). Since outdoor recreation expenditures are a relatively small percentage of total expenditures (income), differences between the two measures are expected to be negligible.

## **BENEFIT TRANSFER METHODS**

There are two broad approaches to benefit transfer: (1) value transfer, and (2) function transfer (Figure1). Value transfers encompass the transfer of (1-a) a single (point) benefit estimate from a study site, or (1-b) a measure of central tendency for several benefit estimates from a study site or sites (such as an average value), or (1-c) administratively approved estimates. Administratively approved value estimates will be discussed in conjunction with the measure of central tendency discussion (hereafter average value transfer will refer to both (1-b) and (1-c)). Function transfers encompass the transfer of (2-a) a benefit or demand function from a study site, or (2-b) a meta regression analysis function derived from several study sites. Function transfers then adapt the function to fit the specifics of the policy site such as socioeconomic characteristics, extent of market and environmental impact, and other measurable characteristics that systematically differ between the study site(s) and the policy site. The adapted function is then used to 'forecast' a benefit measure for the policy site.

We will discuss each of these methods in the following sections, including a simple example application for each. However, we will first define and identify what the benefit measures are, what they mean, and how they were estimated.



**Figure 1. Benefit transfer approaches (From Rosenberger and Loomis, 2001)**

### **Single Point Estimate Transfer**

A single point estimate benefit transfer is based on using an estimate from a single relevant primary research study (or range of point estimates if more than one study is relevant). The primary steps to performing a single point estimate transfer include identifying and quantifying the management or policy induced changes on recreation use, and locating and transferring a ‘unit’ consumer surplus measure. The text-box (Figure 2) provides a more detailed list of the steps involved in single point estimate transfers.

## **SINGLE POINT ESTIMATE TRANSFER**

1. Identify the resources affected by a proposed action or alternative.
2. Translate resource impacts to changes in recreational use.
3. Estimate recreation use changes.
4. Search the spreadsheet for relevant study sites.
5. Assess relevance and applicability of study site data.
6. Select a benefit measure from a single relevant study or a range of benefit measures if more than one study is relevant.
7. Multiply benefit measure by total change in recreation use.

**Figure 2. Steps to performing a single point estimate transfer.**

We provide information that aids in identifying study site benefit measures from the literature.<sup>3</sup> The bibliography and the spreadsheet include studies conducted from 1967 through 2003 in the United States and Canada. There are 593 studies and 1,239 benefit measures identified. The spreadsheet includes a full reference, recreation activity, geographic region, methodology used, etc., for each observation.

It is important to note that all 'unit' benefit measures are in consumer surplus per activity day per person. Therefore, when translating resource impacts into recreation use changes, these impacts should be expressed in a comparable index as changes measured in activity days or convert the activity day measures into the relevant units.

The simplicity with which the steps to performing a single point estimate transfer are presented may be misleading. The steps involved in finding a valid and reliable benefit measure can be complex if taken to their theoretical extreme. This should become apparent when the information on the conditions for and limitations to benefit transfers are taken into account as previously identified. See Boyle and Bergstrom (1992) for an example of critically filtering existing research for applicability to a policy site context. In their example, they located five studies that measured the benefit of white water rafting. They then filtered the studies by three idealized technical considerations:

- (1) the nonmarket commodity of the site must be identical to the nonmarket commodity to be valued at the policy site;
- (2) the populations affected by the nonmarket commodity at the study site and the policy site have identical characteristics;
- and (3) the assignment of

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<sup>3</sup> Another database that contains recreation use values in addition to other values for the environment is the Environmental Valuation Reference Inventory™ (EVRI™). This is a subscription database and can be found at <http://www.evri.ec.gc.ca/evri/>.

property rights at both sites must lead to the same theoretically appropriate welfare measure (e.g., willingness to pay versus willingness to accept compensation) (p.659).

Their filtering of each study based on these considerations left them with no ideal benefit measures to transfer to their policy site. They state that this is likely to be the case for many transfer scenarios in which “a small number of potential study sites are available and the value(s) estimate at these study sites may not be applicable to the issue at the policy site” (p.660). Therefore, when performing critical single point estimate benefit transfers, the original reporting of the study results must be obtained in order to determine its applicability to the evaluation issue at hand.

Benefit transfer is as much an art as it is a science. However, quite often information can be transferred with varying levels of confidence. A confidence interval for transferred point estimates can be calculated if the original study reports the standard error of the estimate. This confidence interval provides the statistical range in which we would expect the estimate to be some large percentage of the time (e.g., a 95% confidence interval means the estimate would be within the calculated range 95% of the time).

### **Average Value Transfer**

An average value transfer is based on using a measure of central tendency of all or subsets of relevant and applicable studies as the transfer measure for a policy site issue. The primary steps to performing an average value transfer include identifying and quantifying the management or policy induced changes on recreation use, and locating and transferring a ‘unit’ average consumer surplus measure. The text-box (Figure 3) provides a more detailed list of the steps involved in average value transfers.

### **AVERAGE VALUE TRANSFER**

1. Identify the resources affected by a proposed action.
2. Translate resource impacts to changes in recreational use.
3. Estimate recreation use changes.
4. Search the spreadsheet for relevant study sites.
5. Assess relevance and applicability of study site data.
6. Use average value provided in Table 2 for that region or use the average of a subset of applicable study measures.
7. Multiply benefit measure by total change in recreation use.

**Figure 3. Steps to performing an average value transfer.**

### **SUMMARY**

We present the results of a literature review of outdoor recreation use valuation studies, including study source, benefit measures, recreation activity, valuation methodology, and geographic region. We also provide tables that reference the bibliography for each activity, enabling easy location of studies. Our literature review spans 1967 to 2003 and covers more than 20 recreation activities. We then provided guidance on performing various benefit transfer methods. Benefit transfer is the use of past empirical benefit estimates to assess and analyze current management and policy actions. Two benefit transfer approaches (single point estimates, average values) were discussed in detail.

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