

Presentation Meeting

Wyoming Water
Development
Commission



**Bear River
Watershed**

Level I Study - April 18, 2016

research & consulting inc.



Purpose of Study

- Gather Existing Watershed Information
- Describe & Inventory Watershed
- Evaluate Current Function of Watershed
- Identify Issues and Challenges
 - Upland Water
- Develop Viable Management Solutions

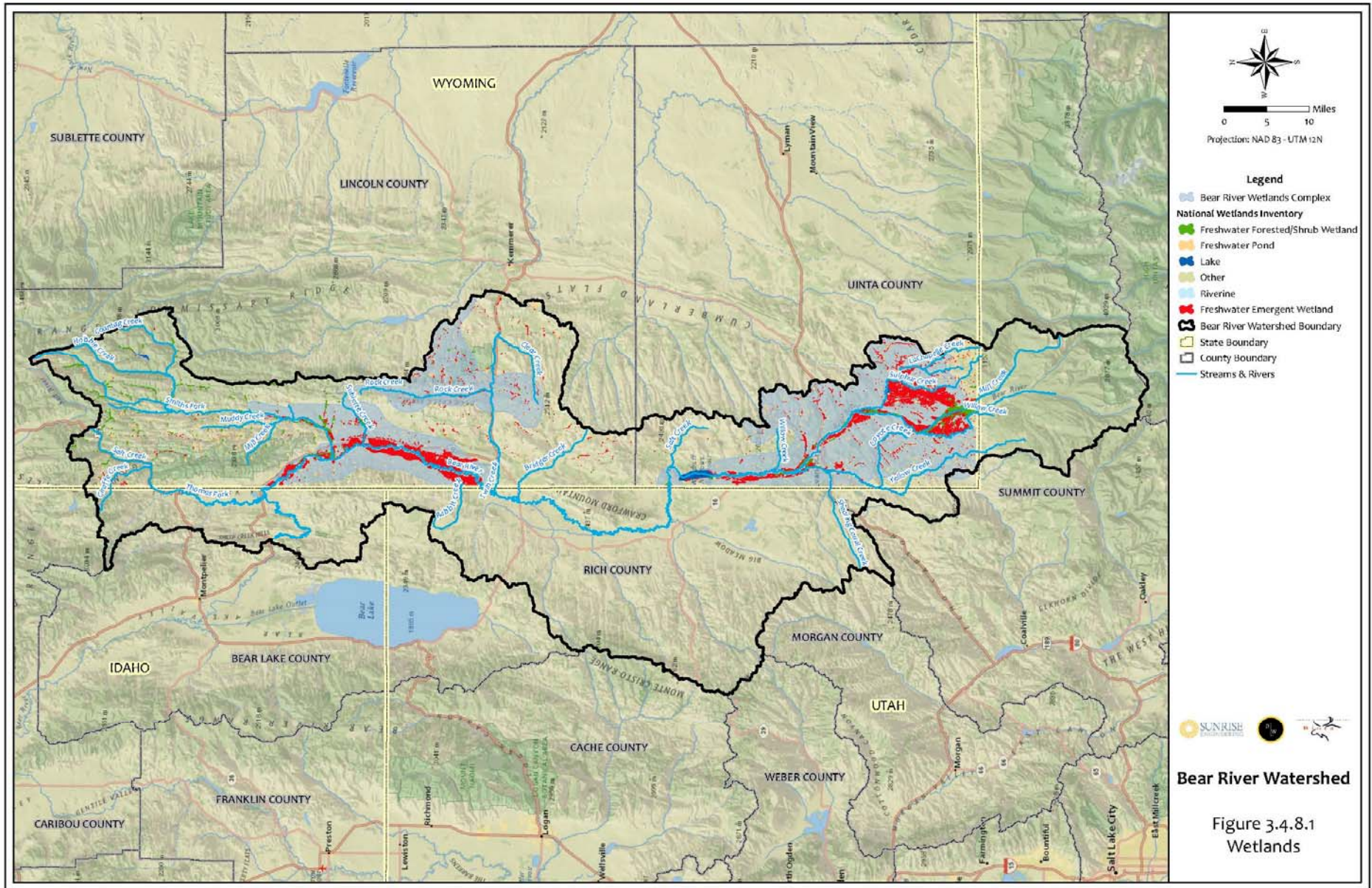
SMALL WATER PROJECT PROGRAM

- IMPROVE WATERSHED CONDITION AND FUNCTION
- WELLS, PIPELINES, SPRINGS, SOLAR, TROUGHS, RESERVOIRS, REHABILITATION
- CONSERVATION AND IRRIGATION DISTRICTS SPONSOR PROJECTS
- \$135,000 PROJECT COST
- \$35,000 MAXIMUM GRANT
- APPLY BY JANUARY 1st

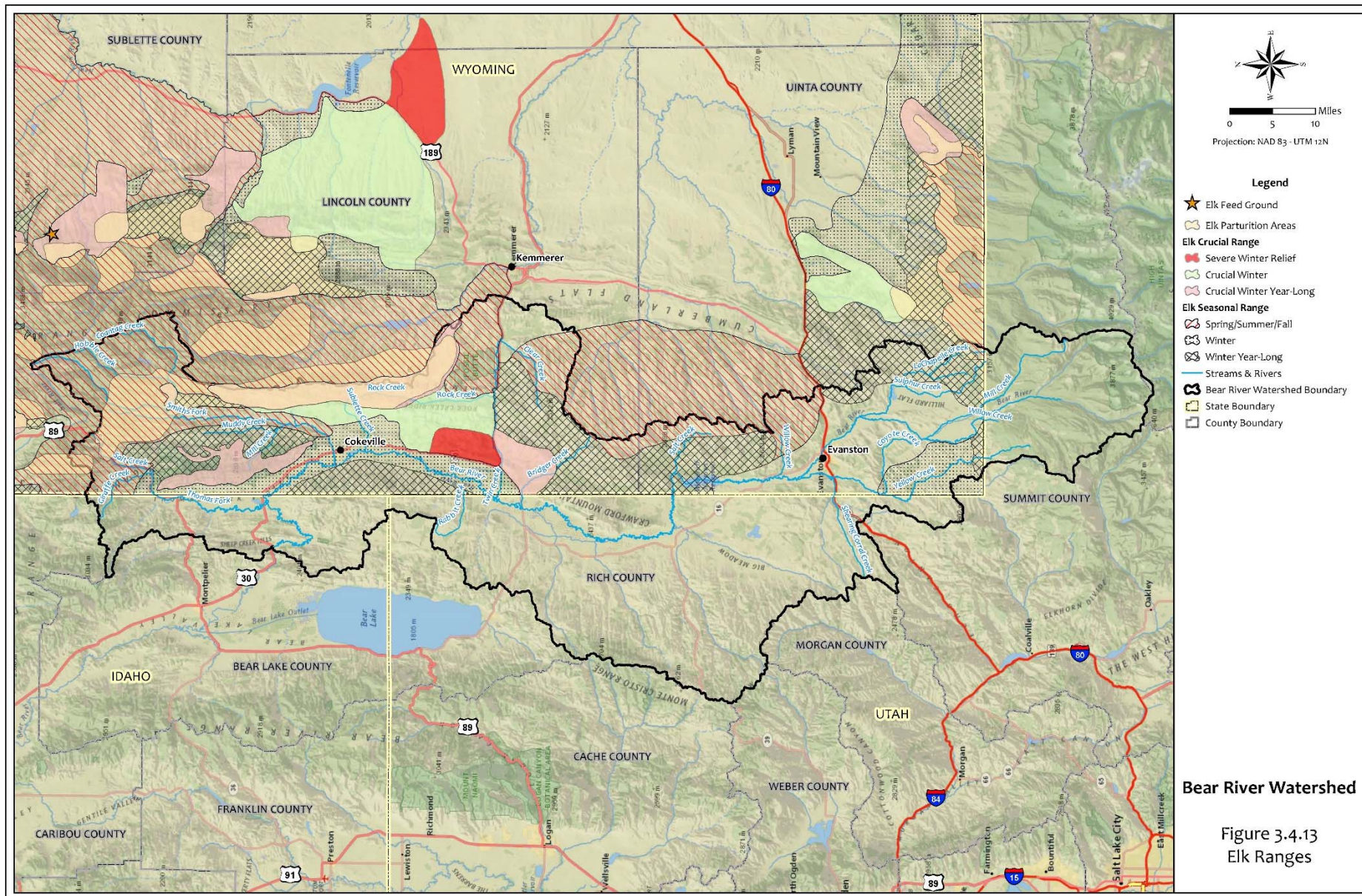
PROJECT DATA

- LAND USE / LAND MANAGEMENT
- NATURAL RESOURCES
- HYDROLOGICAL ANALYSIS
- GEOMORPHIC CHARACTERIZATIONS
- IRRIGATION
- UPLAND WATER AND LIVESTOCK GRAZING
- RANGE CONDITIONS
- WATER STORAGE
- WILDLIFE

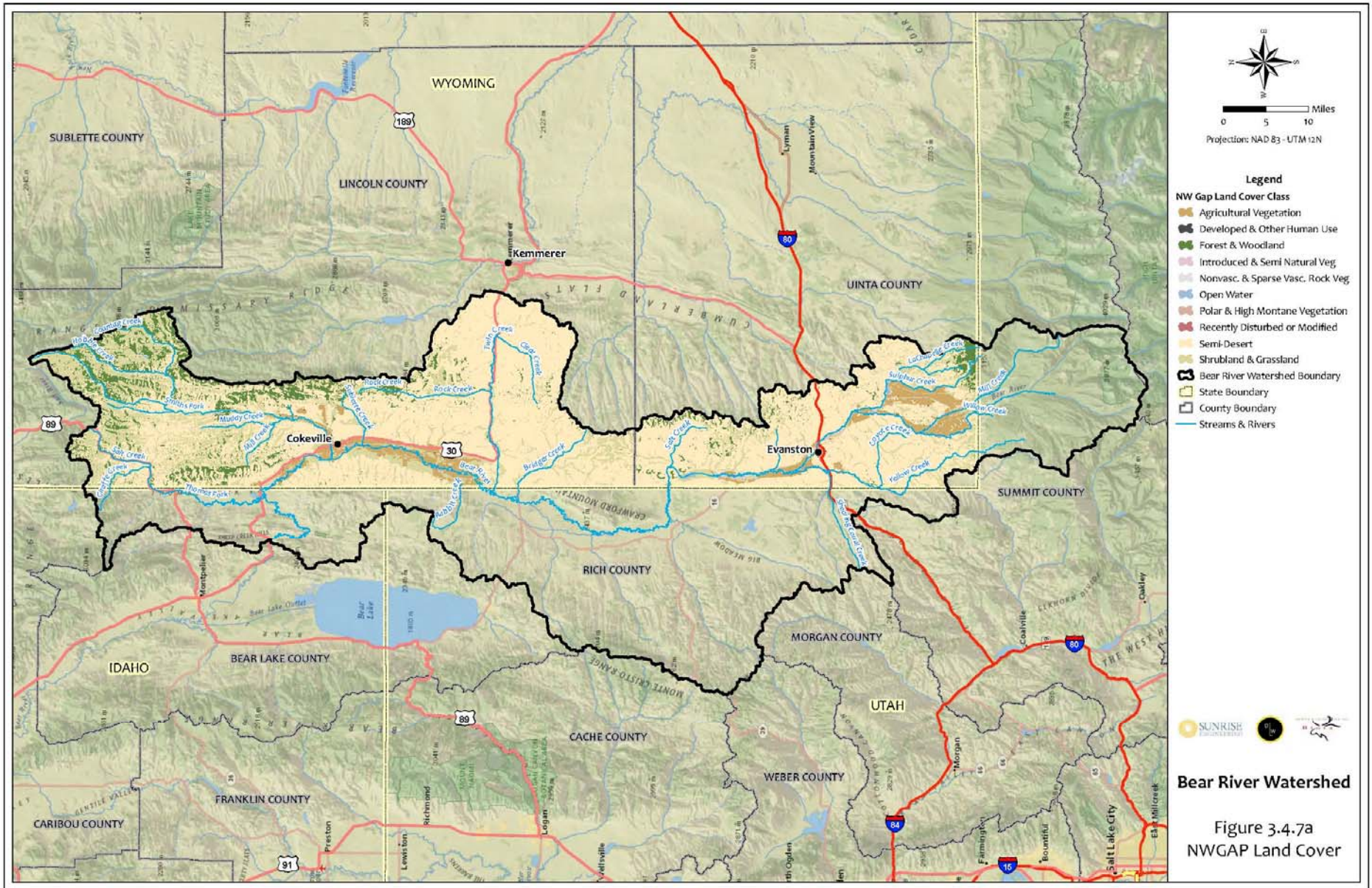
PROJECT DATA



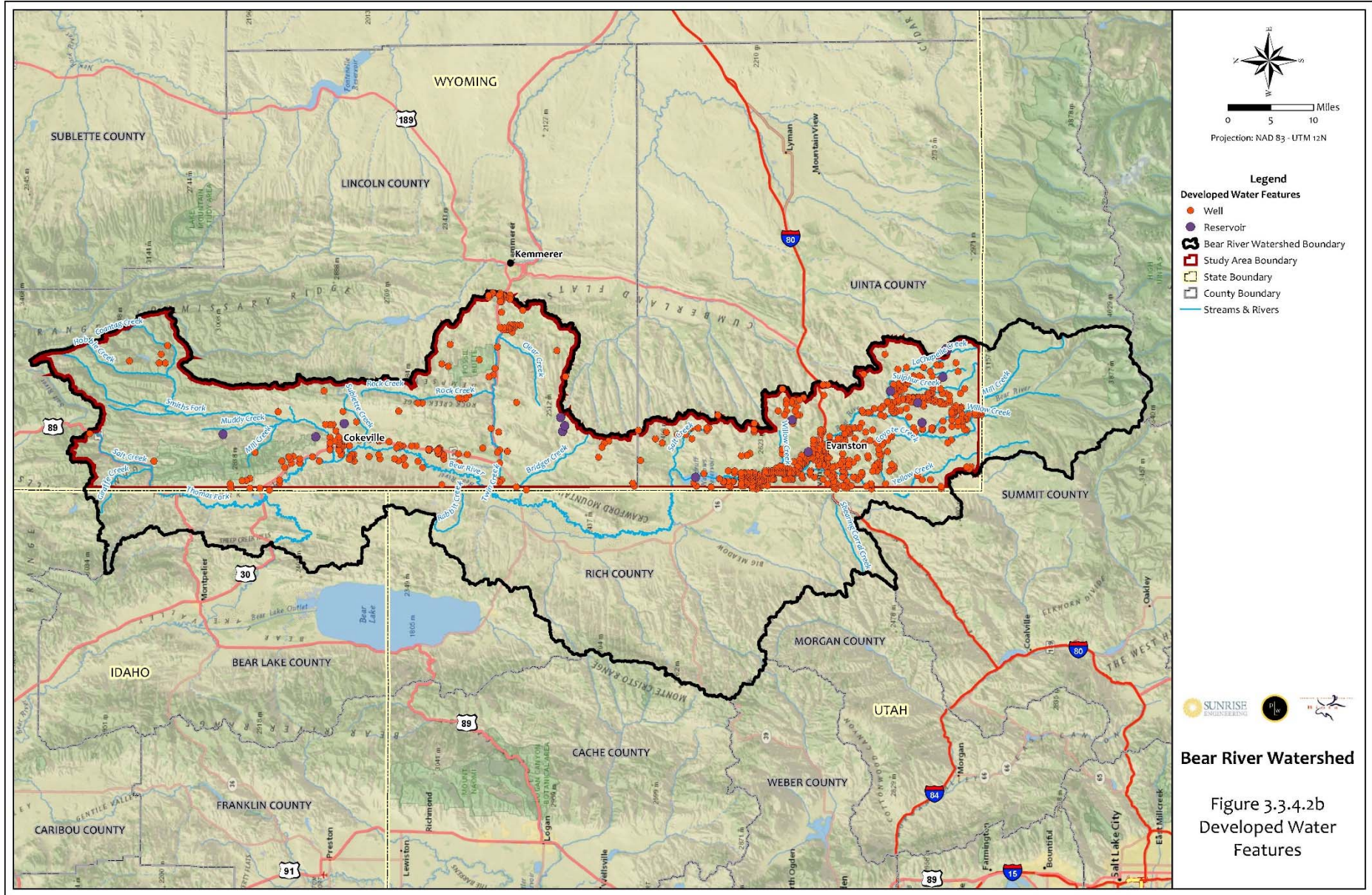
PROJECT DATA



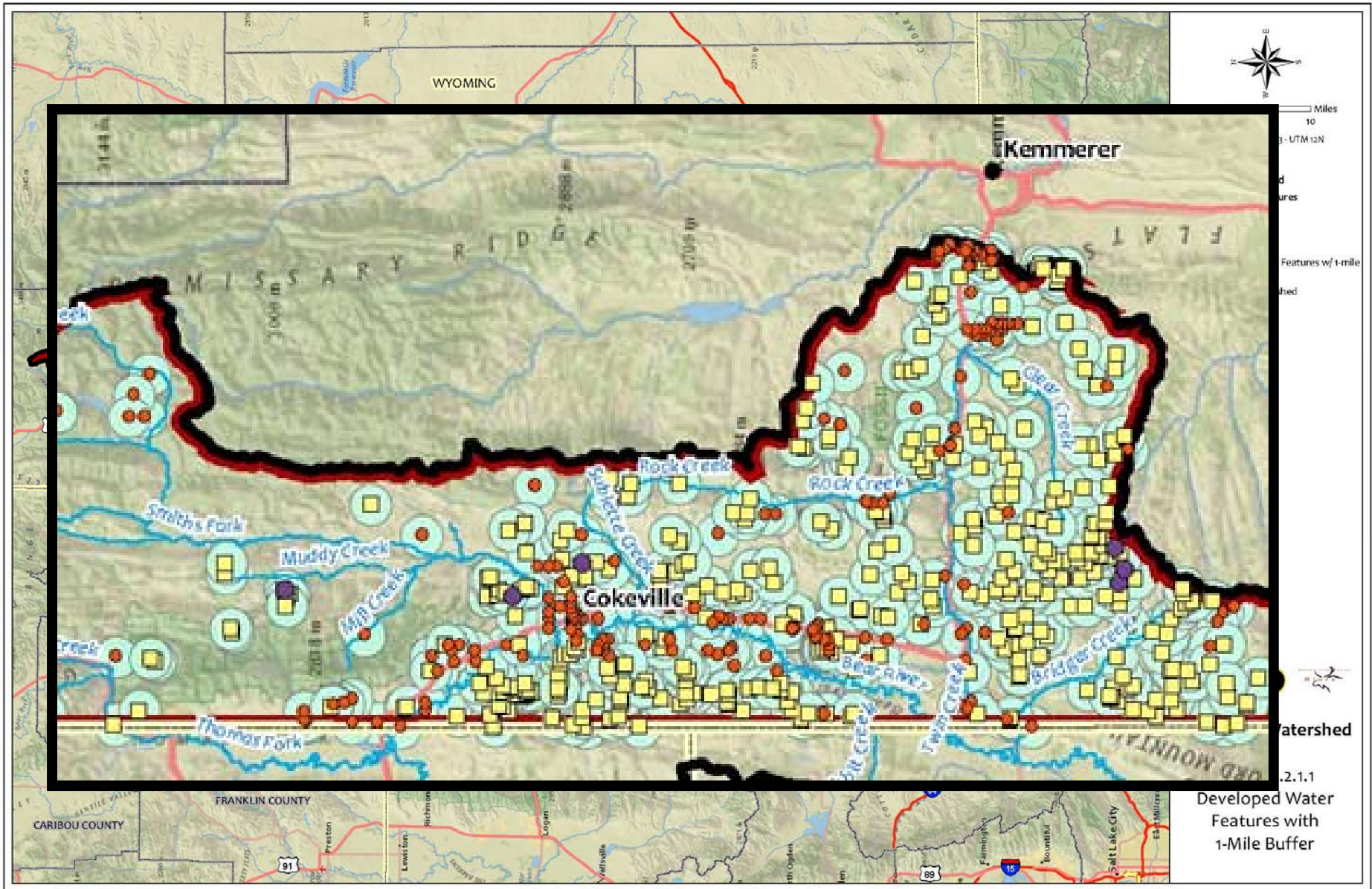
PROJECT DATA



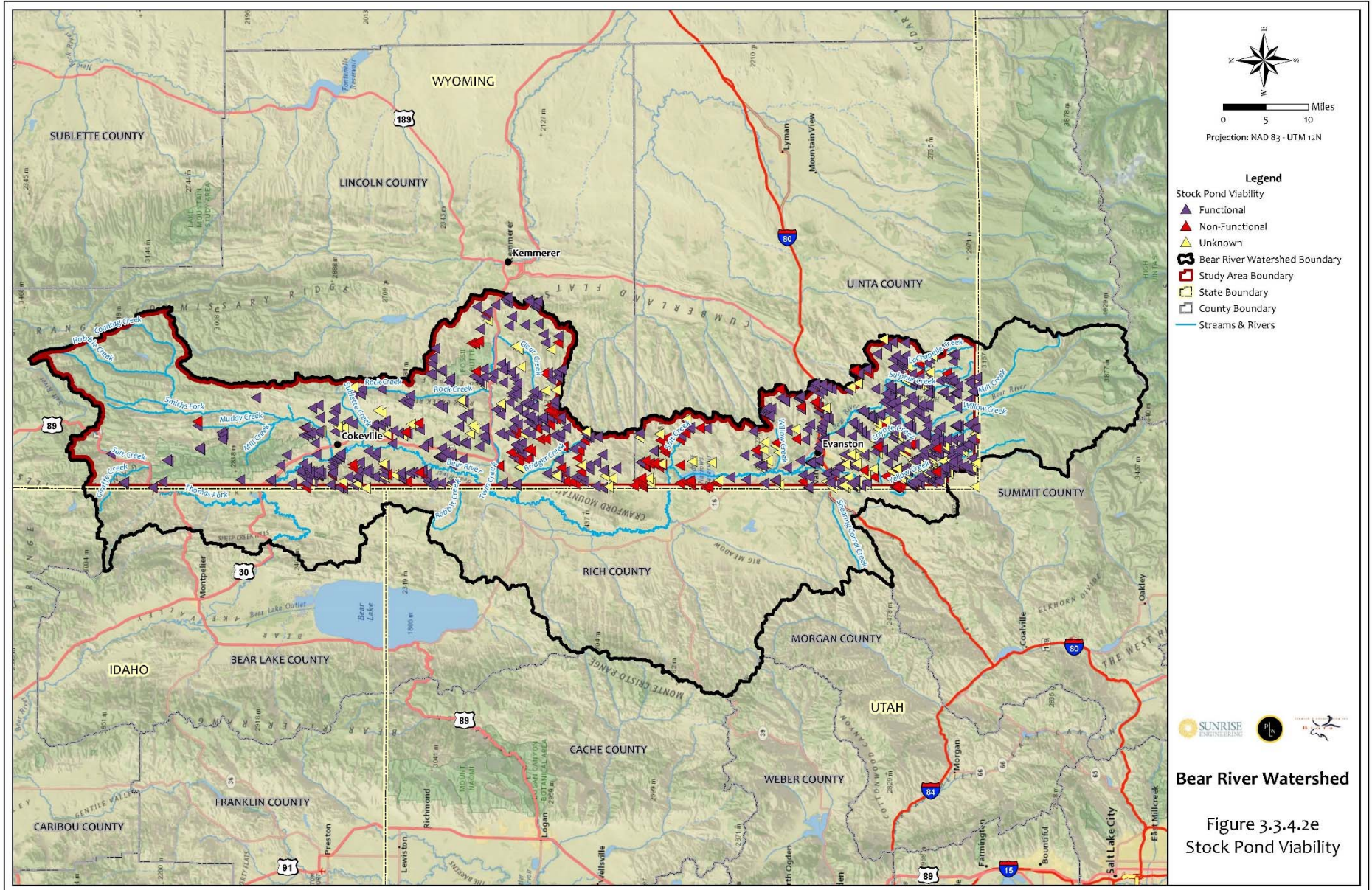
PROJECT DATA



PROJECT DATA



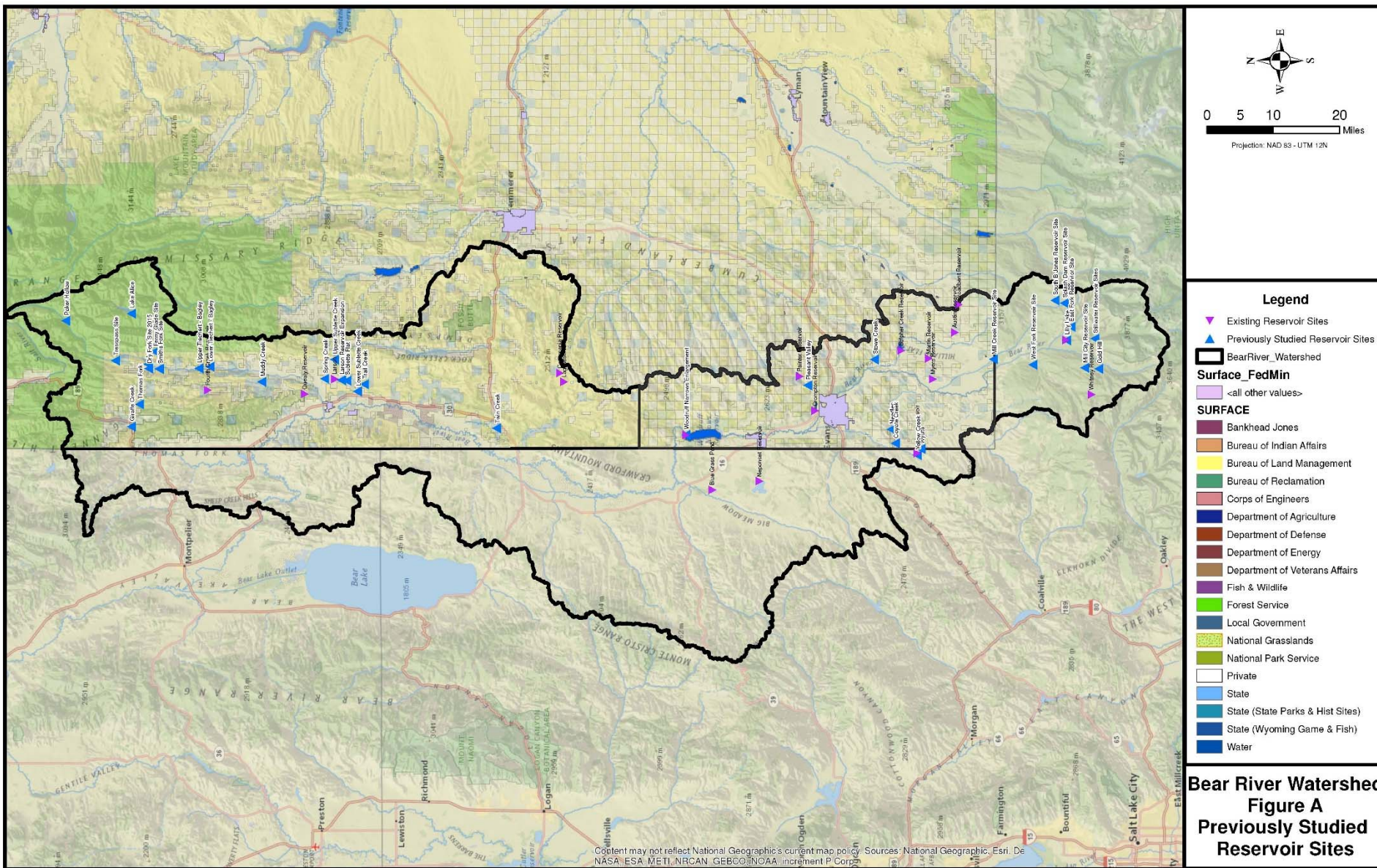
PROJECT DATA



Water Storage

- Review Water Storage Studies
 - 12 Previous Studies With Significant Reservoir Storage Components
 - 41 Sites Passed Some Level of Previous Screening
 - Several Sites have been constructed

Water Storage Potential Sites



Water Storage Matrix

Favorable for Project

Minimal Difficulty

Cost / Permitting Impact

Caution; Could be Fatal Flaw

Potential Fatal Flaw

Water Storage Matrix Lower Bear

Bear River Watershed Potential Reservoir Sites																									
Site #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Proposed Reservoir Site Name	Lower Teichert-Bagley	Upper Teichert-Bagley	Smiths Fork	Ashby	Ferney Glade	Trespas	Lower Sublette Creek	Lower Sublette Creek	Upper Sublette Creek	Larson Reservoir Expansion	Larson Reservoir Expansion	Sublette Flat	Sublette Flat	Trail Creek	Dry Fork	Giraffe	Pokerhollow	Spring Creek	Thomas Fork	Twin Creek	Muddy Creek	Greasy Spoon (Smiths Fork in Lower Studies)	Leeds Creek (Construct)	Lake Alice (P)	
Historic Studies Addressing Site (see list at bottom)	2, 3, 6	2, 3, 6, 8	3, 5, 8	2, 3, 6	2, 3, 6	2, 3, 6	7, 8, 9	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	10	
On Channel/Off Channel	On Channel	On Channel	On Channel	On Channel	On Channel	On Channel	Off Channel	Off Channel	On Channel	Off Channel	Off Channel	Off Channel	Off Channel	Off Channel	Off Channel	On Channel	On Channel	On Channel	On Channel	On Channel	Off Channel	On Channel	Off Channel	Off Channel	On Channel
Source Stream Name	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Hobble Creek	Smiths Fork	Smiths Fork	Smiths Fork	Sublette Creek	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork	Smiths Fork
County	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln	Lincoln
Reservoir Size (Acre Feet)	14,000-16,000	14,000-16,000	17,000	5,000-21,000	10,000-20,000	4,400-10,000	4,200	9,000	1,700	5,000	15,000	5,000	10,000	10,000	3,600-6,000	5,000	10,000-11,500	5,850	10,000-11,500	5,850	5,000	4,900	4,900	4,900	
Dam Height (ft.) ¹⁾	114	107	109	70-125	105-157	84-155	57	71	142	78	103	70	100	73	70	85	70-98	75	117	117	117	117	70	70	
Crest Length	1,980	1,850	2,250	1,070-1,450	600-1,570	780-1,780	2,720	1,957	610	3,738	5,174	2,951	5,586	2,809	490	460	690	1,200	710	710	710	710	710	710	
Tributary Area (Sq. Mi.)	178	174	157	147	90	42	29.7	30.0	4.3	3.0	3.0	3.8	3.8	9.3	15.0										
Mean Basin Elevation							7,100.0	7,500.0	7,600.0	6,440.0	6,440.0	6,420.0	6,420.0	7,050.0											
Irrig. Conv. Eff.	50%	50%	47%	46%	45%	45%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	
Min. Instream Flow (cfs)	65	65	65	65	40	26																			
Supply Conveyance (miles)	No	No	No	No	No	No	Existing Infrastructure	Existing Infrastructure	No	26	26	26	26	26	31	Yes								Yes 1mi from end of Covey Canal Pump 100 vertical feet	No
Geology	Surficial material, shale to sandstone, limestone	Surficial material, shale to sandstone, limestone	Surficial material, shale to sandstone, limestone	Surficial material, mudstone, siltstone, sandstone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Shale to sandstone, limestone	Shale to sandstone, limestone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone	Surficial material, sandstone, siltstone, claystone
Land ownership	Private, State, BLM	Private, State, BLM	Private, State, BLM	Private, State, BLM	Private, State, BLM	BLM, Forest	Private, State, BLM	Private, State, BLM	Private, BLM	Private, BLM	Private, BLM	Private, BLM	Private, State, BLM	Private, State, BLM	Private, State, BLM	Private	USFS	BLM	State	State	Private, State, BLM	State	USFS	USFS	
Inundated Acreage	380	425	570	120-355	390	923-524	260	404	30	238	544	213	473	212				220.0	400.0	853.0					
Inundated Infrastructure	Yes	Class 1 Sovey Favorable	Class 1 Sovey Favorable	Class 1 Sovey Favorable	Class 1 Sovey Favorable	Class 1 Sovey Favorable	Covey Canal, Sublette Cutoff Trail, Mau Drch	Covey Canal, Sublette Cutoff Trail, Mau Drch	Branch	No	No	No	No	No	Forest Service Road	Private Road and Development	USFS Road & Warning Hut		Roads	Roads?	Roads?	Roads?	Roads?	Roads?	
Cultural or Archaeological Wetlands Impacts	171	141	125	88	234	100	7	81	5	13	15	13	13	18	12										
Threatened or Endangered	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Ute ladies' tresses, yellow-billed cuckoo, northern leopard frog	Canada Lynx - Yellow-Billed Cuckoo	Canada Lynx - Yellow-Billed Cuckoo									Canada Lynx Critical Habitat
Sage Grouse	Necking Habitat	Necking Habitat	Necking Habitat	Necking Habitat	Necking Habitat	Necking Habitat	In compliance with Governor's EO	In compliance with Governor's EO																	Yes, Within 2 miles of LER
Big Game Impacts	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range	Mule Deer - Crucial Winter Range
Fish Impacts	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	Bonneted Catfish, Leadwren-side Chub	
Year of Most Recent Cost Estimate	2004	2004	2004	2004	2004	2004	2004	2006	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	
Cost on Date of Estimate	\$ 11,800,000	\$ 10,800,000	\$ 10,572,000	\$ 11,040,000	\$ 13,020,000	\$ 13,560,000	\$ 24,500-26,700,000	\$ 19,600,000	\$ 10,100,000	\$ 25,800,000	\$ 58,000,000	\$ 25,300,000	\$ 62,900,000	\$ 28,500,000											
Cost in 2016 @ 3%/annum inflation	\$ 19,075,500	\$ 15,388,218	\$ 15,073,144	\$ 15,740,400	\$ 18,563,407	\$ 19,933,318	\$ 26,700,000	\$ 24,105,528	\$ 12,421,726	\$ 31,730,746	\$ 71,332,684	\$ 31,115,809	\$ 77,369,066	\$ 35,061,045											
2016 Cost/Acre Ft	\$ 1,405.39	\$ 1,099.87	\$ 886.46	\$ 1,124.13	\$ 1,325.96	\$ 1,493.94	\$ 6,157.14	\$ 2,478.99	\$ 7,306.90	\$ 6,346.15	\$ 4,755.11	\$ 6,232.16	\$ 5,157.27	\$ 7,012.28											

Water Storage Matrix Upper Bear

Site #	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
Proposed Reservoir Site Name	Needles (Coyote Creek)	Stowe Creek	Woodruff Narrows Enlargement	Coyote Creek	Myers (Constructed)	Pleasant Valley	Mill Creek	West Fork	South B Jones	Splash Dam	East Fork	Stillwater (sp?)	Mill City	Yellow Creek	Wyuta	Gold Hill	Lilly Lake	
Historic Studies Addressing Site (see list at bottom)	2,		2,	2,	2,	2,	2,10	4,10			2,	2,10		2,10	2,	2,	2,	
On Channel/Off Channel	On Channel	On Channel	On Channel	On Channel	Off Channel	On Channel	On Channel	On Channel			On Channel	On Channel			On Channel			
Source Stream Name	Yellow Creek	Stowe Creek					Mill Creek	West Fork			East Fork	Stillwater Fork						
County	Uinta	Uinta	Uinta	Uinta	Uinta	Uinta	Summit-Utah	Summit-Utah	Summit-Utah	Summit-Utah	Summit-Utah	Summit-Utah	Summit-Utah	Uinta and Summit-Utah	Summit-Utah	Summit-Utah	Summit-Utah	
Reservoir Size (Acre Feet)	35,000	400	28,400	25,000	15,000	50,000	2,350	20,000			8,500			16,000	146,000	1,055	2,000-2,500	
Dam Height (ft.) ⁽¹⁾	111	20	70	70	86	117	93	140			95			100	170		53	
Crest Length	825	450	615		1310	1,000								1850	1850			
Tributary Area (Sq. Mi.)							45				38							
Mean Basin Elevation																		
Irrig. Conv. Eff.																		
Min. Instream Flow (cfs)		None																
Supply Conveyance (miles)																		
Geology	Surficial material Possible Wasatch Fm, claystone, siltstone, sandstone, conglomerate, possible marine shale High angle faults in vicinity Near quaternary fault Significant foundation treatment	Surficial material Wasatch Fm, claystone, siltstone Near Quaternary fault Foundation treatment	Surficial material Mudstone, siltstone, sandstone Numerous high angle faults in vicinity Near quaternary fault Significant foundation treatment	Surficial material Wasatch Fm High angle and thrust faults in foundation Near quaternary fault Significant foundation treatment	Surficial material Wasatch Fm High angle and thrust faults in foundation Near quaternary fault Significant foundation treatment	Surficial material Conglomerate, tuffaceous siltstone and sandstone, Wasatch Fm Numerous high angle faults in foundation Significant foundation treatment	Surficial material Wasatch Fm & glacial deposits Near numerous Quaternary faults Foundation treatment	Surficial material Wasatch Fm & glacial deposits Left abutment consists of landslide deposit Near Quaternary fault Foundation treatment	Surficial material Wasatch Fm Thrust fault in vicinity Located on an old landslide Foundation treatment	Surficial material Wasatch Fm & glacial deposits Thrust fault possible in foundation Significant foundation treatment	Surficial material Wasatch Fm & glacial deposits Adjacent to Quaternary fault Foundation treatment	Surficial materials Glacial deposits, Wasatch Fm & limestone Thrust fault possible in foundation Left abutment is debris flow fan Significant foundation treatment	Surficial materials Glacial deposits & Wasatch Fm Near numerous thrust faults Significant foundation treatment	Surficial material Claystone, siltstone, sandstone, conglomerate, possible marine shale Thrust and high angle faults in vicinity On quaternary fault Significant foundation treatment	Surficial material Wasatch Fm High angle and thrust faults in vicinity Near quaternary fault Significant foundation treatment	Surficial material Glacial deposits & limestone Adjacent to numerous thrust faults Significant foundation treatment	Surficial material Glacial deposits & limestone Adjacent to Quaternary fault Foundation treatment	Surficial material Wasatch Fm & glacial deposits Adjacent to Quaternary fault Foundation treatment
Land ownership	Private	Private, State	Private, State, BLM	Private, BLM		Private, BLM	Private	Private	USFS	USFS	Private, USFS	USFS		Private, BLM	BLM, Private	USFS	USFS	
Inundated Acreage		30		1900			120				350			1200				
Inundated Infrastructure		near RR				Road	Road, Residence							Pipeline				
Cultural or Archaeological																		
Wetlands Impacts							Consider Orange	Consider Orange		Consider Orange	Consider Red	Consider Red	Consider Red			Consider Red	Consider Orange	
Threatened or Endangered																		
Sage Grouse																		
Big Game Impacts			Mule Deer - crucial Winter Range				Moose, Crucial Winter											
Fish Impacts							Ebenezer Cultural											
Year of Most Recent Cost Estimate		2016					1983	1983			1983			1983				
Cost on Date of Estimate		\$ 2,094,000					\$ 3,000,000	\$ 6,300,000			\$ 4,500,000			\$ 5,900,000				
\$ Cost in 2016 @ 3%/annum inflation		\$ 2,094,000					\$ 7,957,006	\$ 16,709,712			\$ 11,935,509			\$ 15,648,778				
2016 \$ Cost/Acre Ft		\$ 5,235.00					\$ 3,385.96	\$ 835.49			\$ 1,404.18			\$ 978.05				

Water Storage

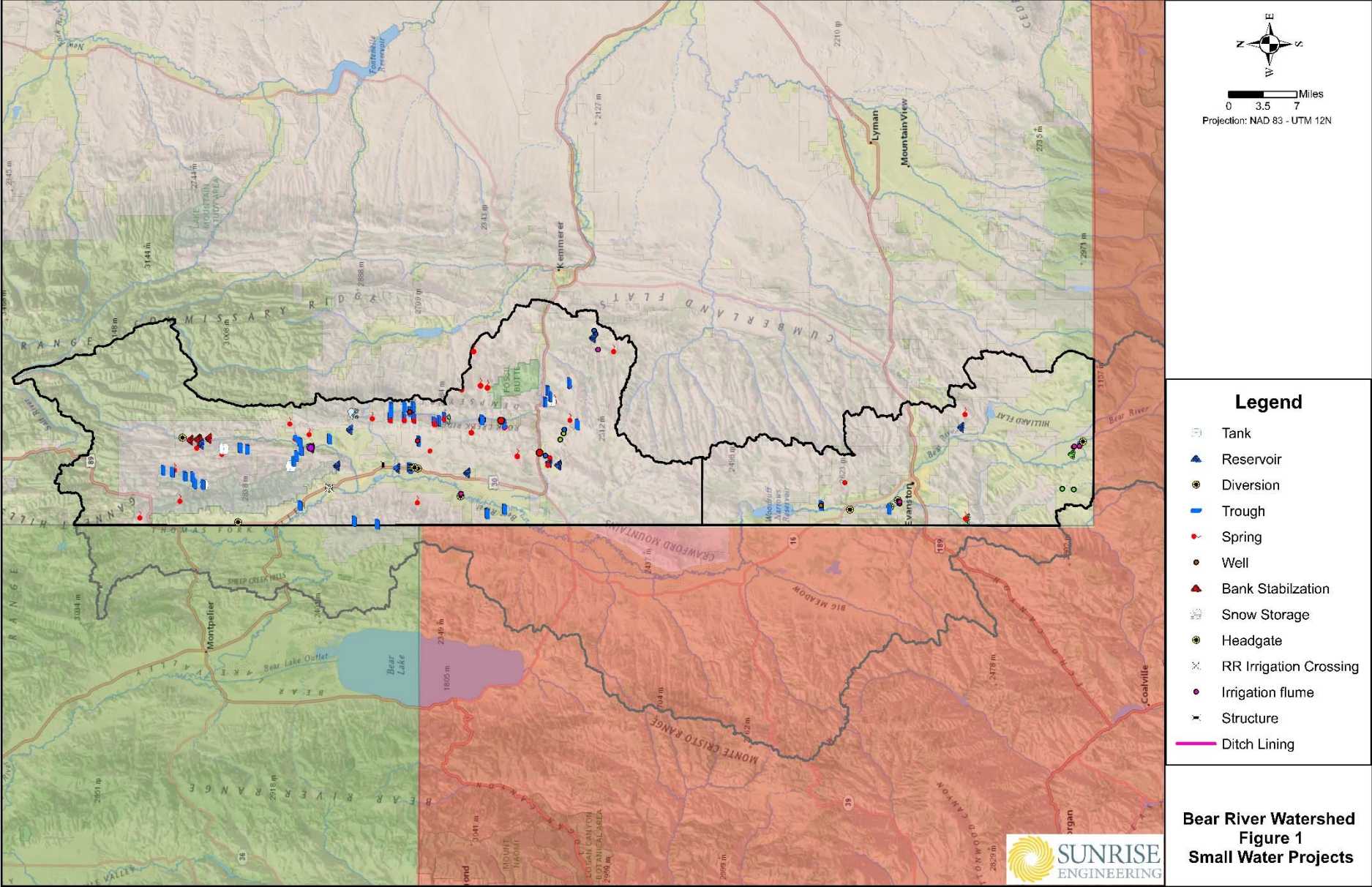
- Characteristics of Leading Sites
 - Located off Channel or at Existing Sites
 - Smaller in Size (1,000 to 15,000 acre-feet)
 - Fewer Environmental or Political Hurdles

Watershed Management & Rehabilitation Plan

- Irrigation and Upland Water Upgrades/Rehabilitation
 - Head Gates and Ditches
 - Wells
 - Catchments
 - Tanks and Troughs
 - Automation



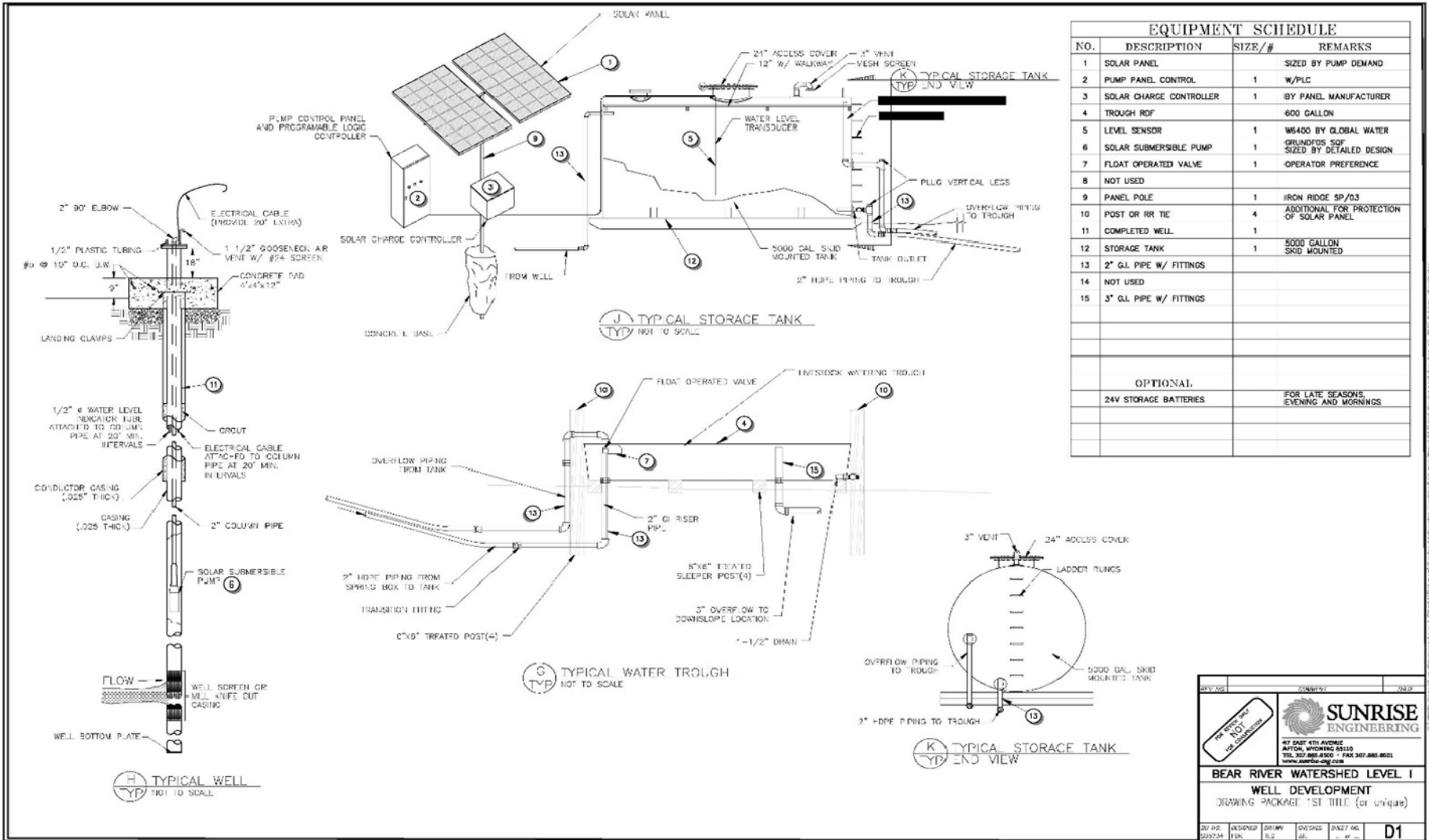
UPLAND WATER DEVELOPMENT



Watershed Management & Rehabilitation Plan

- Small Upland Water Development Opportunities
 - 18 Landowner/Lessee
 - BLM -17 Projects
 - Landowner/lessee - 45 Projects

TYPICAL UPLAND PROJECT COMPONENTS



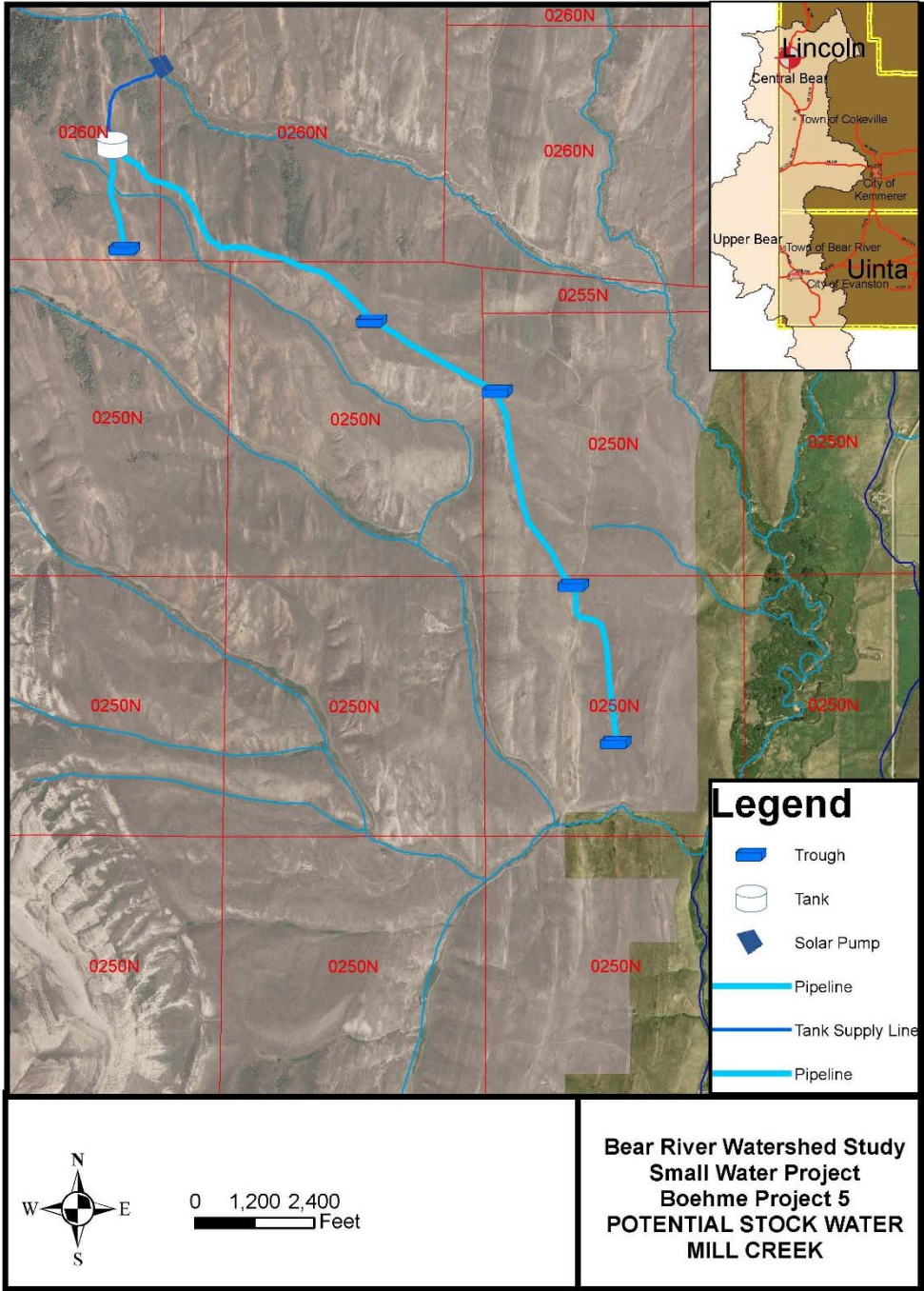
SUNRISE ENGINEERING

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BEAR RIVER WATERSHED LEVEL I
WELL DEVELOPMENT
 DRAWING PACKAGE 'ST TITLE (or unique)

REV 002
 DATE 03/24/24
 DESIGNED BY: []
 CHECKED BY: []
 DRAWN BY: []
 SCALE: []
 SHEET NO. [] OF []

D1



Cost Estimates Project Financing

- UPLAND WATER PROJECTS COST
 - \$2,000 TO \$500,000
 - 62 PROJECTS
 - TOTAL OF ALL PROJECTS = \$4.4 MILLION

Watershed Management & Rehabilitation Plan

- Irrigation Development Opportunities
 - 25 Landowner/Lessee Participated
 - 44 Projects

Watershed Management & Rehabilitation Plan



Watershed Management & Rehabilitation Plan



Cost Estimates Project Financing

- IRRIGATION RELATED PROJECT COST
 - \$2,000 TO \$2.1 MILLION
 - 44 PROJECTS
- TOTAL OF ALL PROJECTS = \$13 MILLION

Thank You

www.bearriverwatershedstudy.com/

