BIOMONITORING PLAN
FOR
SEEDSKADEE NATIONAL WILDLIFE REFUGE
SWEETWATER COUNTY, WYOMING
November 1991

Prepared By
Pedro Ramirez, EC Specialist
Fish & Wildlife Enhancement
Cheyenne, Wyoming

and

Mike Bryant, Acting Refuge Manager
Seedskadee National Wildlife Refuge

EXECUTIVE SUMMARY

Seedskadee National Wildlife Refuge (NWR) is located in Sweetwater County approximately 20 miles north of Green River, Wyoming (Figure 1). The refuge encompasses 14,842 acres of riparian and upland habitat along the Green River. The refuge was established in 1965 to mitigate for wildlife habitat losses created by the construction of Fontenelle and Flaming Gorge reservoirs and provide habitat for migratory birds as authorized by the Colorado River Storage Act of 1956. Seedskadee NWR is located in the Wyoming Basin Ecoregion as described by Omernik (1986).

The Wyoming Basin Ecoregion is characterized by long, cold winters and short, mild summers. Yearly temperatures range from -30 to 95 ^{o} F with a growing season of 85 days. Elevations at Seedskadee NWR range from 6,190 to 6,490 feet above sea level. Precipitation averages 7 inches per year. Soils are generally poorly drained, low in salinity and have moderate alkalinity. The refuge has developed approximately 200 surface acres of palustrine emergent and palustrine open water wetland habitat. Palustrine wetland communities are dominated by pondweed (Potamogeton spp.), rushes (Scirpus spp.), cattails (Typha spp.), and arrowgrass (Triglochin spp.). Riparian areas are dominated by narrowleaf cottonwood (Populus angustifolia), and willow (Salix spp.). Upland habitats are comprised of shrubs, such as greasewood (Sarcobatus vermiculatus), saltbrush (Atriplex sp.), rabbitbrush (Chrysothamnus sp.) and sagebrush (Artemisia sp.) and grasses.

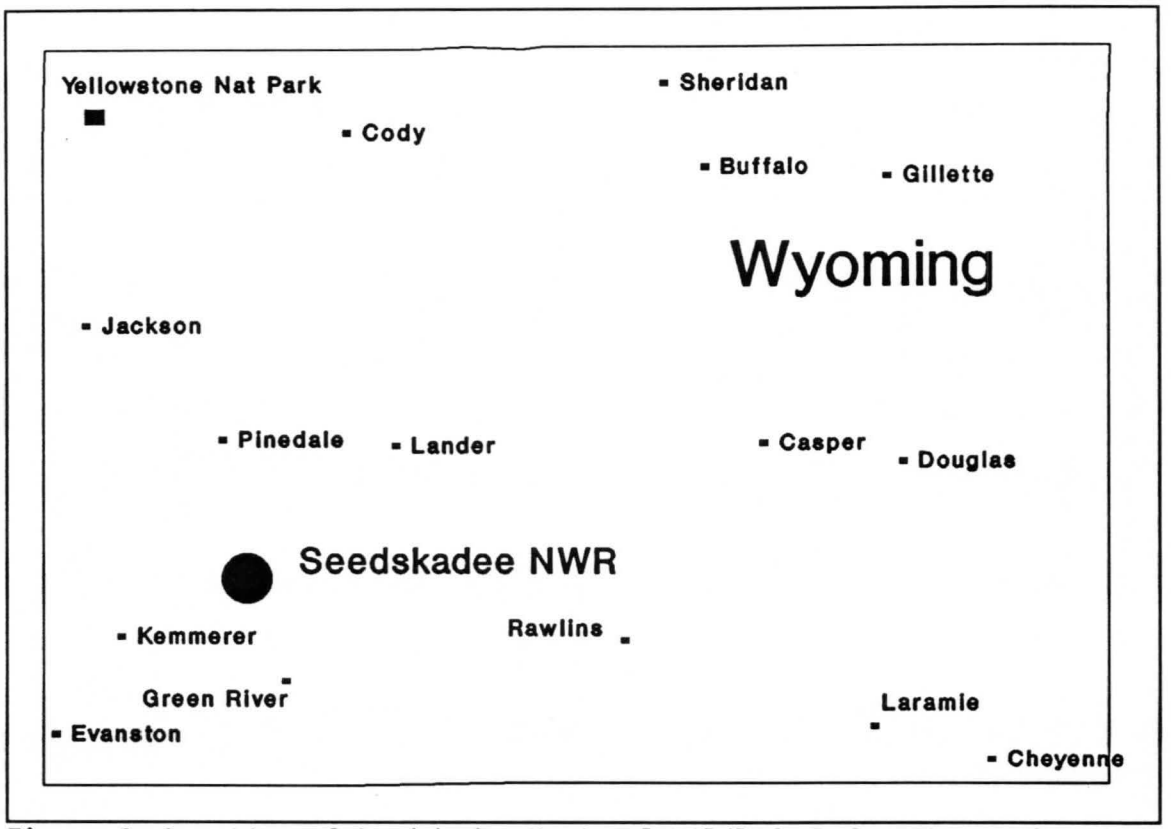

Figure 1. Location of Seedskadee National Wildlife Refuge in southwestern Wyoming.

The riverine and palustrine wetland habitats occur along the narrow floodplain of the Green River. The wetlands provide nesting habitat for numerous species of waterfowl and shorebirds. Waterfowl nesting on the refuge, in order of abundance, include: cinnamon teal (Anas cyanoptera), blue-winged teal (A. discors), gadwall (A. strepera), mallard (A. platyrhynchos), northern pintail (A. acuta), redhead (Aythya americana), ruddy duck (Oxyura jamaicensis), common merganser (Mergus merganser), common goldeneye (Bucephala clangula), northern shoveler (Anas clypeata), green-winged teal (A. crecca), American widgeon (A. americana) and Canada goose (Branta canadensis). Shorebirds such as American coots (Fulica

americana), also nest on the refuge.

Federally-listed threatened and endangered species occuring on Seedskadee NWR include: the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), and whooping crane (Grus americana). The bald eagle winters along the Green River and one pair is nesting on the refuge. The peregrine falcon and whooping crane migrate through the refuge on occassion.

Big game species inhabiting the refuge include: mule deer (Odocoileus hemionus), moose (Alces alces), and pronghorn (Antilocapra americana). Seedskadee NWR provides recreation for 4,000 visitors each year, half visit the refuge to fish the Green River, 200 are waterfowl or big game hunters and the remainder visit to watch wildlife.

The Seedskadee NWR Management Plan lists the following refuge goals and objectives:

- GOAL - Preserve, restore and enhance federally-listed endangered and threatened species and the habitats upon which they depend.

  -Objectives:

  1. To provide safe, contaminant-free habitats for endangered or threatened species that occassionally use the area: notably: whooping crane, peregrine falcon and bald eagle.

2. To cooperate as requested in all aspects of the federal and state program for the black-footed ferret recovery.

- GOAL - Provide appropriate habitat for breeding and migratory requirements of waterfowl and other migrating birds along the Green River.

Objectives:

1. To restore and maintain sufficient habitat to produce 10,000 ducks annually.

2. To provide habitat requirements of 1,000 nesting geese producing 800 goslings annually.

3. To maintain a 3-year average of 35 % Mayfield nest success or higher.

- GOAL - Provide appropriate habitat for requirements of resident wildlife species such as moose, mule deer, antelope and sage grouse.

Objectives:

1. Maintain moose and mule deer populations within carrying capacity levels and specifically manage for large antlered males to enhance the public's viewing enjoyment.

- GOAL - Provide a range of opportunities for compatible wildlife/wildlands-oriented interpretation and recreation.

Objectives:

1. To provide fishing access and other recreational opportunities.

Land uses adjacent to Seedskadee NWR include: livestock grazing, mining, oil and gas exploration and production, and recreation. Farming is practiced along the Green River upstream of Fontenelle Reservoir and along the Big Sandy River upstream of Farson. Alfalfa and barley are the principle crops grown. Crops are irrigated with surface water from the Fontenelle and Eden Irrigation Projects.

Large trona (soda ash) deposits exist in the Green River Basin downstream from Fontenelle Reservoir (Figure 2). Trona or soda ash is used as a base for detergents and water softeners as well as in glass manufacturing. Trona is mined using underground shaft mining methods. Wastewater generated during the trona processing is contained in large evaporation ponds at several of the production facilities.

Oil and gas exploration and production occurs throughout the Green River Basin in Wyoming. Several refineries are located at La Barge, Wyoming upstream of the refuge. Oil and gas wells occur throughout the Green River basin. Many well sites contain waste pits used in separating oilfield produced water from oil. Several oil and gas pipelines cross the Green River immediately upstream and downstream of Seedskadee NWR (Figure 2). The Naughton coal-fired power plant is located

upwind and west of the refuge near Kemmerer.

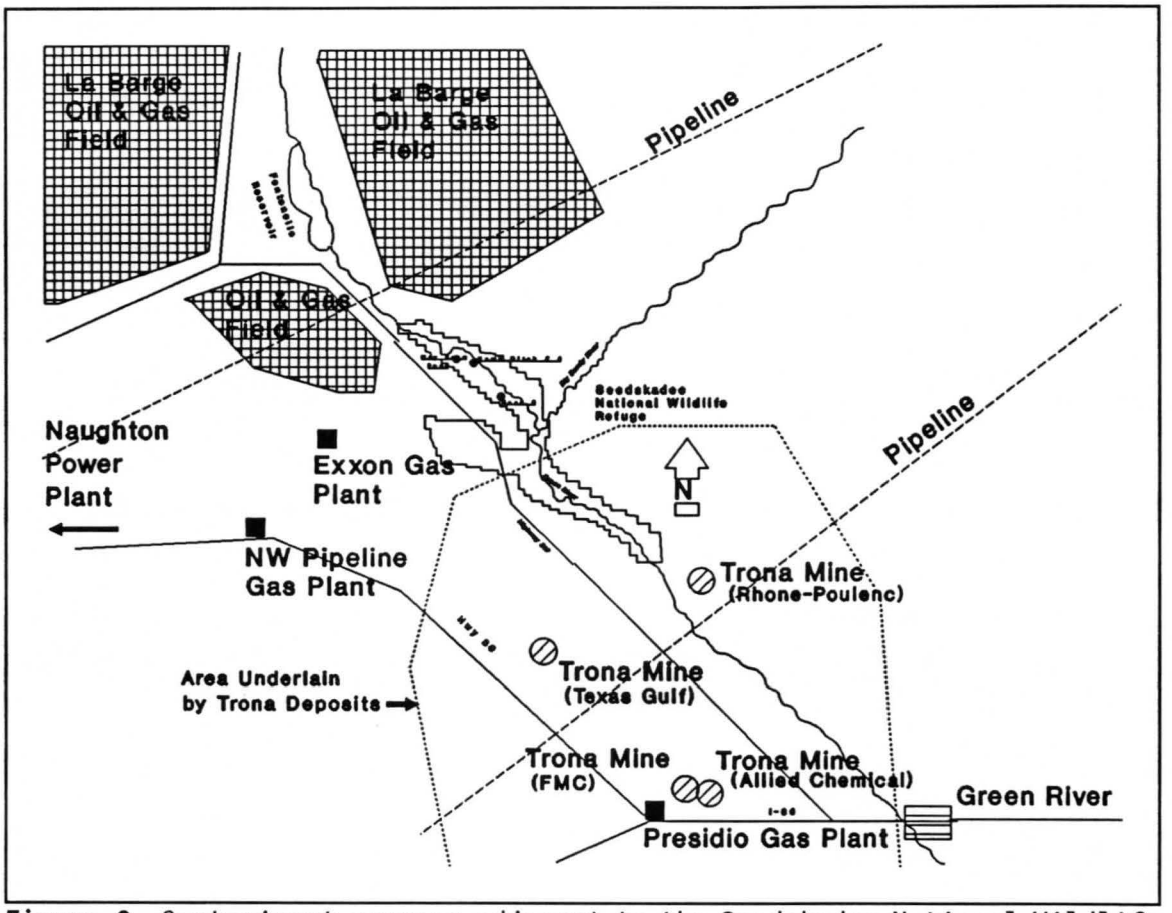

Figure 2. Contaminant sources adjacent to the Seedskadee National Wildlife Refuge, Sweetwater County, Wyoming.

Contaminant Assessment Area # 1

The Hay Farm Pond, Pond # 2 and Hamp Ditch at the Seedskadee NWR were selected as the principle locations for the first Contaminant Assessment Area (CAA)(Figure 3). Hay Farm Pond was selected based on the elevated concentrations of boron in pondweed (Potamogeton spp.)(Ramirez and Armstrong, 1991). The source of the boron is unknown. Hamp Ditch is the primary entry point for water diverted from the

Green River onto the refuge. Thus, any contaminants present in the river as a consequence of hazardous materials spills or other events, would enter the refuge through Hamp Ditch. Pond # 2 would serve as a reference site within the refuge.

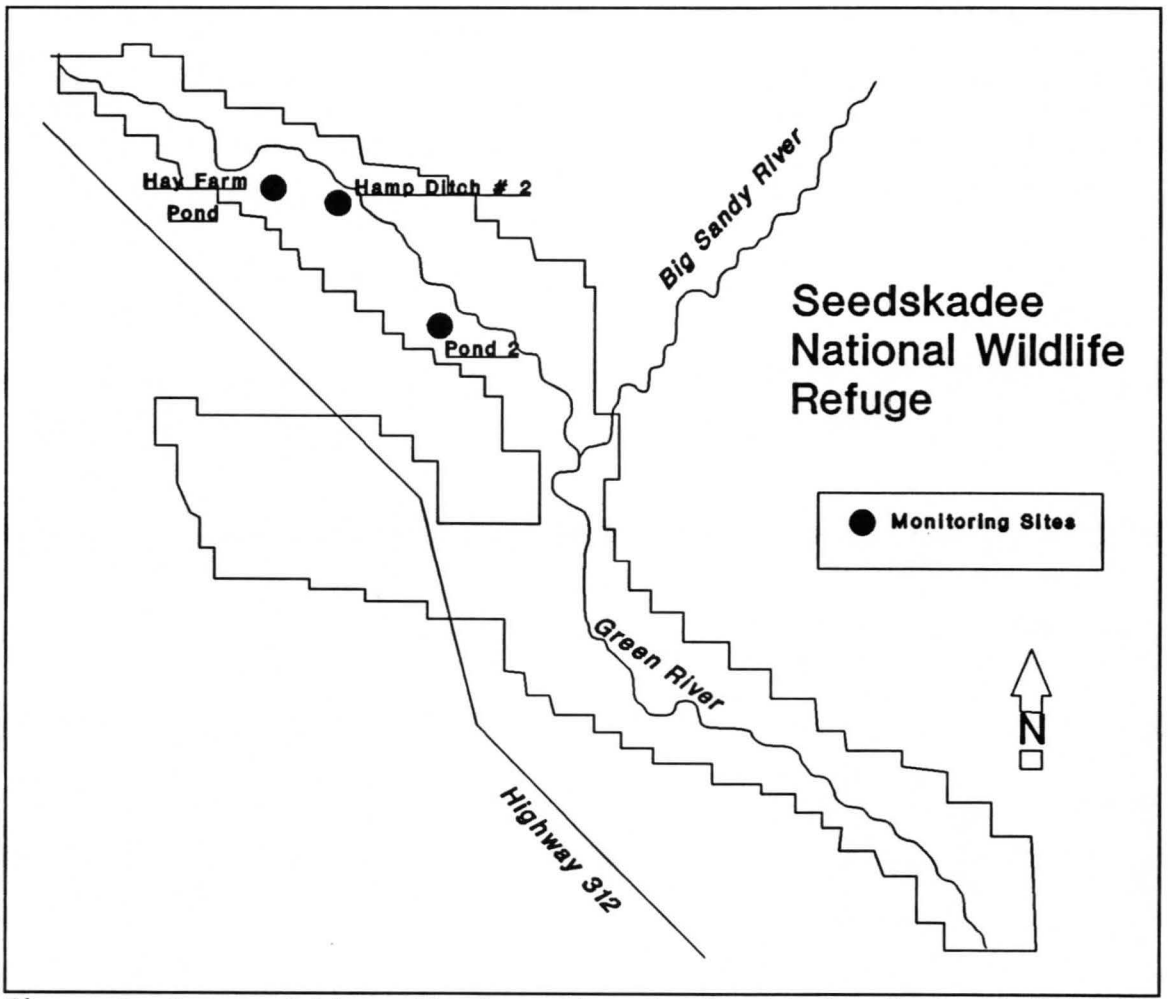

Figure 3. Proposed biomonitoring sites for Seedskadee National Wildlife Refuge, Sweetwater County, Wyoming.

Pond # 2 provides nesting habitat for numerous species of aquatic birds.

Monitoring Strategy for CAA # 1

Sediments would be collected from Hay Farm Pond, Hamp Ditch and Pond # 2. Sediment from Hay Farm Pond and Pond # 2 would be analyzed for trace elements. Sediment from Hamp Ditch and Pond # 2 would be analyzed for petroleum hydrocarbons. This would provide baseline information on hydrocarbon levels that could be relied on in the event of a pipeline-related oil spill upstream of the refuge.

Contaminant Assessment Area # 2

CAA # 2 includes the Green River reach upstream of the refuge to the La Barge area and downstream to the Rhone-Poulenc Trona Plant. This area was selected based on the potential for migratory birds to move off the refuge and become exposed to oil waste pits or trona wastewater ponds.

Monitoring Strategy for CAA # 2

Monitoring on CAA # 2 would be restricted to follow-up on major bird die-offs. Monitoring of bird mortalities at the Rhone-Poulenc Trona Plant is currently performed by the company. Service special-agents and the Fish and Wildlife Enhancement Office at Cheyenne propose to work with the trona plants to prevent bird mortalities from occurring. Additionally, Service special-agents and the Fish and Wildlife Enhancement Office at Cheyenne are working with State and Federal regulatory agencies and the oil industry to prevent migratory bird deaths in oilfield waste pits. The monitoring effort should keep track of measures taken

to prevent migratory bird deaths in the oilfields and trona plants. Annual progress reports should be solicited from the trona plants and the Bureau of Land Management on efforts to prevent migratory bird deaths. To determine if migratory birds from the refuge are visiting the waste ponds at the oilfields and or trona plants and suffering adverse impacts, bird carcasses recovered at the refuge should be submitted for necropsy, hydrocarbon analyses (bile) and brain sodium analyses. Additionally, birds carcasses recovered from the oilfield and trona wastewater ponds should be submitted for necropsy, hydrocarbon analyses (bile) and brain sodium analyses.

Benefits of Biomonitoring at Seedskadee NWR

Land acquisition is ongoing at the Seedskadee NWR. Biomonitoring would provide valuable information useful to the acquisition process, especially downstream where the trona wastewater ponds present a hazard to migratory birds. Biomonitoring would also provide baseline information on the quality of the refuge. This baseline data would be valuable in the event of an oil spill on the Green River immediately upstream of the refuge.

REFERENCES

Omernik, James M. 1986. Ecoregions of the United States. Map Supplement to the Annals of the Association of American Geographers. Vol. 77 No. 1.

Ramirez, Pedro Jr. and Joni A. Armstrong. 1991. Environmental contaminants surveys in three national wildlife refuges in Wyoming. U.S. Fish and Wildl. Service, FWE, Cheyenne, Wyoming, EC Report (publication pending).

2. ASSESSING THE SL MANAGEMENT GOALS AND OBJECTIVES RELEVANT TO CONTAMINANT MONITORING

2.1 Management Goals and Objectives for these Service Lands

Why are these lands being managed by the Service, that is, what are the FWS priorities for the SL? Are there specific characteristics of the SL that should be considered while developing a contaminant monitoring strategy? Complete the categories below and rank them 1, 2, or 3 according to the priority given them at this area (1 = highly important, 2 = moderate importance, 3 = low importance, and NA = not applicable). Provide a brief comment regarding the specific reasons it should be considered when developing the monitoring strategy for the area. (Attach additional pages if necessary.)

RANK	ASSESSMENT CONSIDERATIONS	GROUP CODE	DESCRIPTION AND COMMENT
1	Federally listed threatened & endangered, or candidate species (including research)	ES	Bald Eagle nest on NWR; Peregrine Falcons and whooping cranes occassionally migrate through refuge;
	State listed or candidate species	SL	
1	Waterfowl	WF	Dabblers, redheads, ruddy ducks nest on the NWR; other divers migrate through NWR; trumpeter swans winter @ NWR
1	Other aquatic birds	QB	Grebes, coots nest on NWR; other shorebirds migrate through refuge
1	Raptors	RA	Red-tailed hawks, Swainson's Hawks, Ferruginous Hawks, Great-horned Owls nest on NWR, Golden Eagles use the NWR
2	Other migratory birds	MB	Various species of Passerine birds nest or migrate through the NWR
2	Other resident wildlife	RW	Moose, mule deer, pronghorn
NA	Anadromous fishes	AF	
3	Other freshwater species	FW	Freshwater fish

Name Pedro Ramirez, Mike Bryant Date 11/05/91

RANK	ASSESSMENT CONSIDERATIONS	GROUP CODE	DESCRIPTION AND COMMENT
NA	Marine mammals	MM	
NA	Other marine organisms	MR	
2	Terrestrial Plants (food/cover, native habitats, etc.)	TP	Cottonwoods, willows
2	Aquatic Plants (food/cover, native habitats, etc.)	AP	Potamogeton (Pondweed) and other submerged aquatic vegetation. Bulrush, cattails and other emergent vegetation
1	Documented or suspected contaminant concerns		Boron concentrations in Potamogeton from Hay Farm Pond > 300 ug/g and < 1,000 ug/g)
1	Geographic location of the area (feeding or staging area, good climatic conditions, breeding area, etc.)		Major waterfowl production area for the Upper Green River basin; major migration stop-over in semi-arid environment
2	Recreational activities (consumptive and nonconsumptive)		Deer hunting; Fishing on Green River; Wildlife observation
NA	Research (for other than T&E species)		None
3	Economic uses (grazing, haying, mining, logging, oil)		None
NA	Other (e.g. wilderness, subsistence, military)		

Name Pedro Ramirez, Mike Bryant Date 11/05/91

RANK	ASSESSMENT CONSIDERATIONS	GROUP CODE	DESCRIPTION AND COMMENT
	Other comments		

Name Pedro Ramirez, Mike Bryant Date 11/05/91

WORKSHEET OM1 **ASSESSING LOCAL OFF-SL AREAS IMPORTANT TO TRUST RESOURCES**

SL Name	Seedskadee NWR		**Region**	6	**State** WY
Investigator's Name	Pedro Ramirez, Mike Bryant			**Date**	Nov. 4, 1991
Area Name/Location	Green River downstream from NWR				
Distance from SL	immediately downstream to approximately 2 miles downstream				
UTM Coordinates	**E (long)**	610000	**N (lat)**	462000	
General Description	Pipeline crosses Green River two miles from NWR, Trona Plant located 2 miles downstream from NWR				
Contact or Agency	BLM, DEQ, Rhone-Poulenc Inc.		**Phone #**		
Current Monitoring Activities Relevant to this Area	FWS-LE working on trona pond bird mortality problem				

RANK*	ASSESSMENT CONSIDERATIONS	GROUP CODE**	DESCRIPTION AND COMMENT
1	Federally listed threatened & endangered, or candidate species (including research)	ES	Bald eagles winter along Green River & nest on NWR, Peregrine Falcons & Whooping Cranes migrate through the area
NA	State listed or candidate species	SL	
1	Waterfowl	WF	Dabbling ducks, redheads and ruddy ducks nest along Green River & in NWR
1	Other aquatic birds	QB	Coots, Grebes and other shorebirds migrate along Green River. Coots & Grebes nest in NWR
1	Raptors	RA	Red-tailed Hawk, Swainson's Hawk, Ferruginous Hawk, Great Horned Owls inhabit the Green River riparian zone & adjacent uplands

* 1-High Importance
2-Moderate Importance
3-Low Importance
NA-Not Applicable

** Codes from Table 1

WORKSHEET OM1

SL Name	Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant			Date	Nov. 4, 1991	
Area Name/Location		Green River downstream from NWR					
2	Other migratory birds	MB	Passerine birds nest on uplands and Green River Riparian zone				
2	Other resident wildlife	RW	Moose, mule deer & pronghorn inhabit the Green River riparian zone & adjacent uplands				
NA	Anadromous fishes	AF					
3	Other freshwater species	FW	Brown Trout, catfish, suckers				
NA	Marine mammals	MM					
NA	Other marine organisms	MR					
2	Terrestrial Plants (food/cover, native habitats, etc.)	TP	Cottonwoods, willows along Green River riparian zone				
2	Aquatic Plants (food/cover, native habitats, etc.)	AP	Potamogeton and other submerged aquatics in shallow ponds and shallow reaches of Green River				
1	Documented or suspected contaminant concerns		Trona wastewater ponds are causing bird mortalities.				

* 1-High Importance
2-Moderate Importance
3-Low Importance
NA-Not Applicable

** Codes from Table 1

WORKSHEET OM1

SL Name	Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant			Date	Nov. 4, 1991	
Area Name/Location		Green River downstream from NWR					
1	Geographic location of the area (feeding or staging area, good climatic conditions, breeding area, etc.)		Green River and adjacent riparian habitat provide corridor for migratory birds in this semi-arid environment.				
2	Recreational activities (consumptive and nonconsumptive)		Fishing in Green River, big game hunting in adjacent uplands				
3	Research (for other than T&E species)						
1	Economic uses (grazing, haying, mining, logging, oil)		Trona mining, oil & gas exploration and production, grazing,				
NA	Other (e.g. wilderness, subsistence, military)						
	Other comments						

* 1-High Importance
2-Moderate Importance
3-Low Importance
NA-Not Applicable

** Codes from Table 1

WORKSHEET OM1 ASSESSING LOCAL OFF-SL AREAS IMPORTANT TO TRUST RESOURCES

SL Name	Seedskadee NWR		Region	6	State WY
Investigator's Name	Pedro Ramirez, Mike Bryant			Date	Nov. 5, 1991
Area Name/Location	Fontenelle Reservoir & Green River upstream from NWR				
Distance from SL	From Refuge boundary upstream for 15 to 20 miles				
UTM Coordinates	E (long)	560000	N (lat)		468000
General Description	Farming along Green River upstream of Fontenelle Reservoir, large oil & gas fields immediately upstream, refinery complex at La Barge				
Contact or Agency	BLM, USBR		Phone #		
Current Monitoring Activities Relevant to this Area	USGS Gaging Stations, Water Quality Measurements				

RANK*	ASSESSMENT CONSIDERATIONS	GROUP CODE**	DESCRIPTION AND COMMENT
1	Federally listed threatened & endangered, or candidate species (including research)	ES	Bald eagles winter along Green River & nest on NWR, Peregrine Falcons & Whooping Cranes migrate through the area
NA	State listed or candidate species	SL	
1	Waterfowl	WF	Dabbling ducks, redheads and ruddy ducks nest along Green River & in NWR
1	Other aquatic birds	QB	Coots, Grebes and other shorebirds nest in shallow wetlands along Green River. Migrate along Green River. Fontenelle provides resting area for waterfowl.
1	Raptors	RA	Various raptors nest and migrate along the Green River

* 1-High Importance
2-Moderate Importance
3-Low Importance
NA-Not Applicable

** Codes from Table 1

WORKSHEET OM1

SL Name	Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant			Date	Nov. 5, 1991	
Area Name/Location		Fontenelle Reservoir & Green River upstream from NWR					
2	Other migratory birds	MB	Various passerine birds nest and migrate along the Green River				
2	Other resident wildlife	RW	Moose, mule deer, pronghorn inhabit riparian zone along Green River and adjacent uplands				
NA	Anadromous fishes	AF					
3	Other freshwater species	FW	Various species of salmonids, catfish, suckers inhabit the Green River				
NA	Marine mammals	MM					
NA	Other marine organisms	MR					
2	Terrestrial Plants (food/cover, native habitats, etc.)	TP	Cottonwoods and willow growing along riparian zone provide important habitat for wildlife				
2	Aquatic Plants (food/cover, native habitats, etc.)	AP	Submerged aquatic plants in shallow wetlands provide food and habitat for fish and aquatic birds				
1	Documented or suspected contaminant concerns		Oilfield sludge pits are causing bird mortalities. Mountaineer Refinery (inactive) at La Barge is an EPA RICRA site.				

* 1-High Importance
2-Moderate Importance
3-Low Importance
NA-Not Applicable

** Codes from Table 1

WORKSHEET OM1

SL Name	Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant			Date	Nov. 5, 1991	
Area Name/Location		Fontenelle Reservoir & Green River upstream from NWR					
1	Geographic location of the area (feeding or staging area, good climatic conditions, breeding area, etc.)		Green River and adjacent riparian habitat provide corridor for migratory birds in this semi-arid environment.				
2	Recreational activities (consumptive and nonconsumptive)		Fishing in Fontenelle Reservoir and Green River, big game hunting in uplands				
3	Research (for other than T&E species)						
1	Economic uses (grazing, haying, mining, logging, oil)		Grazing, oil and gas exploration and production, farming				
NA	Other (e.g. wilderness, subsistence, military)						
	Other comments						

* 1-High Importance
2-Moderate Importance
3-Low Importance
NA-Not Applicable

** Codes from Table 1

WORKSHEET OM2

EXISTING CONTAMINANT INFORMATION

SL Name	Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant				Date	Nov. 5, 1991
No.	Contact/Reference	Contaminant Source Type *	Contaminant Type *	Brief Description of Information		Relevance to Contaminant Monitoring (location, species, time of year, etc.)	
1	USGS, WRD, Cheyenne, WY	AD, AR, IW, MC, PP	TE, SD	Water quality data from gaging stations		every 6 weeks	
2	Wyoming State Office, USFWS, FWE		TE	Baseline data on Trace elements in Coot livers, Invertebrates, Sediment, & aquatic vegetation		One time sampling conducted in 1988 & 1989 for EC study on NWR's in Wyoming.	
3	WY DEQ, John Wagner	IW, PP	TE, PT, PH	data on oilfield produced water discharges & other permitted discharges		Self-monitoring done by permittee. Report submitted to DEQ	
4	Ron Smith, Rhone-Poulenc	MC	SA	data on bird mortalities in trona wastewater ponds			
5	Bob Schick, WY DEQ	IA	AP	Air Monitoring Station @ Refuge HQ		Monitor every 6 days	
6							

* Use Codes from Table 1

WORKSHEET OM4

Contaminant Source Documentation Worksheet
(Summary Data Sheet)

SL Name	Seedskadee NWR				Region	6	State	WY
Investigator's Name	P. Ramirez, Mike Bryant						Date	Nov. 5, 1991
Contaminant Source Name, Location and/or Address	UTM Coordinates E (Long)	N (Lat)	Cont. Source Type *	Associated Contaminants (Specific)	Cont. Type *	Transport Mechanism(s) (A, SW, GW, B)	Specific Pathway(s) to the SL	Sensitive "Imp." Spp. Group*	Key Contacts
La Barge Oil & Gas Field	560000	469000	PP	H2S, Oil, PAH's,	TE,	B	via migratory	WF, QB,	
Big Piney- La Barge	560000	468000	PP	H2S, Oil, PAH's,	TE,	B	via migratory	WF, QB,	
Mountaineer Refinery	560000	468000	PP	H2S, Oil, PAH's,	TE,	B	via migratory	WF, QB,	
Exxon Gas Plant	585000	463000	PP	H2S, Oil, PAH's,	TE,	A, B	via migratory	WF, QB,	
Naughton Power Plant	530000	462000	IA	Airborne	AP	A	Air		
Rhone-Poulenc Trona Plant	610000	462000	MC	Sodium salts,	OI,	A, B	via migratory	WF, QB	Ron Smith

WORKSHEET OM4

Contaminant Source Documentation Worksheet
(Summary Data Sheet)

SL Name	Seedskadee NWR	Region	6	State	WY

* Use codes from Table 1.

Investigator's Name	Pedro Ramirez, Mike Bryant							Date	Nov. 5, 1991
Contaminant Source Name, Location and/or Address	UTM Coordinates E (Long)	N (Lat)	Cont. Source Type *	Associated Contaminants (Specific)	Cont. Type *	Transport Mechanism(s) (A, SW, GW, B)	Specific Pathway(s) to the SL	Sensitive "Imp." Spp. Group*	Key Contacts
Texas Gulf Trona Plant	580000	461000	MC	Sodium Salts,	OI,	A, B	via migratory	WF, QB	
FMC Trona Plant	600000	461000	MC	Sodium Salts,	OI,	B	via migratory	WF, QB	
Allied Chemical Trona	600000	461000	MC	Sodium Salts,	OI,	B	via migratory	WF, QB	
Chevron Phosphate Plant,	650000	460000	MC	low pH in		B	mortality of	WF, QB	
AMOCO Oil Pipeline across	600000	462000	PP,	oil	PH,	SW, B	Via oiled	WF, QB	
Proposed Altamont	585000	465000	PP,	oil	PH,	SW, B	Via oiled	WF, QB	

WORKSHEET OM4

Contaminant Source Documentation Worksheet
(Summary Data Sheet)

SL Name	Seedskadee NWR	Region	6	State	WY
Investigator's Name	Pedro Ramirez, Mike Bryant			Date	Nov. 5, 1991

* Use codes from Table 1.

Contaminant Source Name, Location and/or Address	UTM Coordinates E (Long)	N (Lat)	Cont. Source Type *	Associated Contaminants (Specific)	Cont. Type *	Transport Mechanism(s) (A, SW, GW, B)	Specific Pathway(s) to the SL	Sensitive "Imp." Spp. Group*	Key Contacts
Northwest Pipeline Gas	550000	462000	PP	H2S, PAH's	PH,	A, B	prevailing W	WF, QB,	
Presidio Gas Plant @	600000	460000	PP	H2S, PAH's	PH,	A, B	prevailing W	WF, QB,	
Farson Irrigated Cropland	630000	467000	AD,	Trace Elements,	TE,	SW, GW, B	Big Sandy River,	WF, QB,	
Fontenelle Irrigated	560000	466000	AD,	Trace Elements,	TE,	SW, GW, B	Green River,	WF, QB,	
La Barge Irrigated	560000	468000	AD,	Trace Elements,	TE,	SW, GW, B	Green River,		

* Use codes from Table 1.

WORKSHEET OM4

WORKSHEET OM5 IMPORTANT CONTACTS FOR CONTAMINANT MONITORING

SL Name	Seedskadee NWR	Region	6	State	WY
Investigator's Name	Pedro Ramirez, Mike Bryant			Date	11/05/91

Name	Phone #	Affiliation	Comments
Mike Bryant	307-875-2187	Seedskadee NWR	Acting Manager
Art Anderson	307-772-2374	USFWS - FWE	Fontenelle Project
John Wagner	307-777-7781	WY DEQ	NPDES Permits
District Chief, WRD	307-772-2153	US Geo Survey	River Gaging Sta.
Ron Smith	307-875-2600	Rhone-Poulenc	Trona Plant
Dave Hamel	307-872-3625	Gen. Chemical	Trona Plant
Chris Butler	307-382-5350	BLM-Rock Spgs	Air Qual. Monitor
Bob Schick	307-777-7391	WY DEQ	Air Qual. Monitor

WORKSHEET OM4

SL Name	Seedskadee NWR	Region	6	State	WY
Investigator's Name	Pedro Ramirez, Mike Bryant			Date	11/05/91

Name	Phone #	Affiliation	Comments

WORKSHEET OM6/OM7

IMPORTANT SPECIES IDENTIFICATION WORKSHEET

SL Name		Seedskadee NWR					Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant							Date	11/04/91
"Important" Species or Species Group Name	Spp. Group Code *	Habitat Type	Ecol. Compart-ment**	Primary Food Source	Primary Exposure Medium	Primary Locations of Contaminant Exposure	UTM Coordinates E (Long)	N (Lat)	Comments Relating to Contaminants (sensitivity, pathway, temporal considerations, exposure, etc.)	
Waterfowl	WF	Wetlands	1,2	Vegetation, Invertebrates	SW, diet	Trona Ponds, Oilfield Pits, Oil Spills			vulnerable to mortality from trona ponds or oilfield pits, oil spills	
Aquatic Birds	QB	Wetlands	1,2	Vegetation, Invertebrates	SW, diet	Trona Ponds, Oilfield Pits, Oil Spills			vulnerable to mortality from trona ponds or oilfield pits, oil spills	
Raptors	RA	Riparian, Uplands	3	Small mammals, small birds, carrion	diet	Trona Ponds, Oilfield Pits, Oil Spills			vulnerable to mortality from trona ponds or oilfield pits, oil spills	
Other Migratory Birds	MB	Wetlands, Uplands, Riparian	1	seeds, insects	SW, diet	Oilfield Pits, Oil Spills			vulnerable to mortality from trona ponds or oilfield pits, oil spills	

* Use Species Group Codes from Table 1.

** P - Primary producer 1 - 1st order consumer (herbivore) 2 - 2nd order consumer (carnivore) 3 - 3rd order consumer or greater O - omnivore

WORKSHEETS OM6/OM7

IMPORTANT SPECIES IDENTIFICATION WORKSHEET

SL Name		Seedskadee NWR					Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant							Date	11/04/91
"Important" Species or Species Group Name	Spp. Group Code *	Habitat Type	Ecol. Compart-ment**	Primary Food Source	Primary Exposure Medium	Primary Locations of Contaminant Exposure	UTM Coordinates E (Long) (Lat)	N	Comments Relating to Contaminants (sensitivity, pathway, temporal considerations, exposure, etc.)	
Riparian Vegetation	TP	Riparian	P		air, SW, GW	Oil Spills, Airborne Pollutants			oil spills	
Aquatic Vegetation	AP	Riparian, Wetlands	P		air, SW, GW	Oil Spills, Airborne Pollutants			oil spills	

* Use Species Group Codes from Table 1.

** P - Primary producer 1 - 1st order consumer (herbivore) 2 - 2nd order consumer (carnivore) 3 - 3rd order consumer or greater O - omnivore

WORKSHEET OM8

SL MONITORING LEVEL RANKING

SL Name	Seedskadee NWR	Region	6	State	WY
Investigator's Name	Pedro Ramirez, Mike Bryant			Date	11/05/91

Off-SL Contaminants Transport Mechanism	Monitoring Level
Surface Water	3
Ground Water	4
Air	4
Biota	3

On-SL Contaminants Transport Mechanism	Monitoring Level
Surface Water	3
Ground Water	4
Air	4
Biota	3

Final Assessment	
Off-SL Contaminant Monitoring Level	3
On-SL Contaminant Monitoring Level	3

Comments Regarding Ranking:

* Use Species Group Codes from Table 1.

** P - Primary producer 1 - 1st order consumer (herbivore) 2 - 2nd order consumer (carnivore) 3 - 3rd order consumer or greater 0 - omnivore

WORKSHEET OM8

Potential contaminant sources exist off SL: trona wastewater ponds, oilfield waste pits. Accidental spills possible from oil pipelines crossing the Green River immediately upstream and downstream of refuge. On refuge, boron concentrations between 300 ug/g and 1,000 ug/g have been documented in pondweed samples from the Hay Farm Pond. These concentrations have caused reduced growth in ducklings under controlled laboratory dietary studies.

* Use Species Group Codes from Table 1.

** **P** - Primary producer **1** - 1st order consumer (herbivore) **2** - 2nd order consumer (carnivore) **3** - 3rd order consumer or greater **O** - omnivore

WORKSHEET OM8

OM9 Contaminant Prioritizing Worksheet

SL Name	Seedskadee NWR	Region	6	State	WY
Investigator's Name	P. Ramirez, M. Bryant				

Specific Contaminants	TE	PT	PH	GP	AP	SA	OP	PS	CB
To Monitor	X	X	X			X	X	X	X
Potential Exposure Value	1	2	2	3	3	3	3	3	3
Contaminant Priority Value	2	1	1	2	5	2	2	2	2
Overall Toxicity Value	2	1	1	1	3	1	1	1	1
Species Group									
Waterfowl	2	1	1	1	4	4	1	1	1
Aquatic Birds	2	1	1	1	4	4	1	1	1
T/E Species	2	1	1	1	4	4	1	1	1
Raptors	2	1	1	1	4	4	1	1	1
Other Migratory Birds	2	1	1	1	4	4	1	1	1
Aquatic Vegetation	3	1	2	3	3	1	4	4	4
Riparian Vegetation	3	1	2	3	3	1	4	4	4

Toxicity Values Aquatic AvianMammalian

* Use Species Group Codes from Table 1. Page 30 of 2

** P - Primary producer 1 - 1st order consumer (herbivore) 2 - 2nd order consumer (carnivore) 3 - 3rd order consumer or greater O - omnivore

WORKSHEET OM8

	EC50 or LD50	LC50LD50
1=Extremely Toxic	<0.1 ppm	<40 ppm<50 ppm
2=Highly Toxic	0.1-1.0 ppm	40-200 ppm50-500 ppm
3=Moderately Toxic	1.0-10 ppm	200-1,000 ppm500-5,000 ppm
4=Slightly Toxic	>10 ppm	>1,000 ppm>5,000 ppm

Potential Exposure Values
High = 1
Moderate = 2
Low = 3

* Use Species Group Codes from Table 1.

** **P** - Primary producer **1** - 1st order consumer (herbivore) **2** - 2nd order consumer (carnivore) **3** - 3rd order consumer or greater **O** - omnivore

WORKSHEET OM8

OM9 Contaminant Prioritizing Worksheet

SL Name	Seedskadee NWR		Region	6	State	WY
Investigator's Name	P. Ramirez, M. Bryant					

Local Off-SL Areas Important to Trust Resources (Green River upstream & downstream from Seedskadee NWR

Specific Contaminants	SA*	TE	RM	PH	PT						
To Monitor	X	X		X	X						
Potential Exposure Value	1	2		2	2						
Contaminant Priority Value	1	3		1	1						
Overall Toxicity Value	1	2		1	1						
Species Group											
Waterfowl	1	2		1	1						
Aquatic Birds	1	2		1	1						
T/E Species	1	2		1	1						
Raptors	1	2		1	1						
Other Migratory Birds	1	2		1	1						
Aquatic Vegetation	1	3		1	1						
Riparian Vegetation	1	3		1	1						

Toxicity Values Aquatic AvianMammalian

* Use Species Group Codes from Table 1.

** **P** - Primary producer **1** - 1st order consumer (herbivore) **2** - 2nd order consumer (carnivore) **3** - 3rd order consumer or greater **O** - omnivore

WORKSHEET OM8

	EC50 or LD50	LC50LD50
1=Extremely Toxic	<0.1 ppm	<40 ppm<50 ppm
2=Highly Toxic	0.1-1.0 ppm	40-200 ppm50-500 ppm
3=Moderately Toxic	1.0-10 ppm	200-1,000 ppm500-5,000 ppm
4=Slightly Toxic	>10 ppm	>1,000 ppm>5,000 ppm

Potential Exposure Values
High = 1
Moderate = 2
Low = 3

* Sodium decahydrate salt in trona wastewater in such high concentrations that it causes mortality in birds through ingestion and physically by causing the birds to drown or through hyperthermia through crystallization of sodium crystals on feathers.

* Use Species Group Codes from Table 1.

** P - Primary producer 1 - 1st order consumer (herbivore) 2 - 2nd order consumer (carnivore) 3 - 3rd order consumer or greater O - omnivore

WORKSHEET OM10

REFERENCES FOR TOXICITY VALUES

SL Name	Seedskadee NWR	Region	6	State	WY
Investigators' Names	Pedro Ramirez, Mike Bryant			Dates	

Contaminant	Important Species	Surrogate Species used for Toxicity Testing	Toxicity (mg/kg, ppm) LD50	Toxicity (mg/kg, ppm) LC50	Exposure Method to Determine Toxicity (oral, dermal, aquatic bio-assay, etc.)	References	No.
Trace Elements (Boron)	Waterfowl	Mallard		1,000	oral	Eisler, R. 1990. Boron Hazards to Fish, Wildl. & Inverts. A Synoptic Review. Bio. Rep. 85(1.2)	
Petroleum Products, PAH's	Waterfowl	Mallard			oral, dermal (eggs)	Polycyclic Aromatic Hydrocarbon Hazard to Fish, Wildl. & Invertebrates: a synoptic Review. Bio. Rep. (1.11)	
Salts (Trona Wastewater)	Waterfowl	Mallard				Report on Bird Mortalities by USFWS Special Agent L. Shroeder, 1982.	
Pesticides	Waterfowl	Mallard					

WORKSHEET OM10

WORKSHEET OM11

CONTAMINANT ASSESSMENT AREA MONITORING ACTIVITIES
(Summary Data Sheet)

SL Name		Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant					Date	11/05/91
CAA Number	SDK 1	Location Description	Seedskadee NWR					
Project Number		UTM Coordinates	E (Long)			N (Lat)		
Specific Purpose/Objectives		Monitor Boron Concentration in Submerged Aquatic Vegetation, maintain baseline hydrocarbon data in event of oil spills, monitor influence of trona ponds on NWR.						

Contaminant to Monitor (from OM9)	Medium/Par. to Sample/ Measure (5.2)	When to Sample: Month/Time (5.3)	Contaminant Monitoring Level (6.2)	Contaminant Priority Level (OM9)	RFM & Method Section # (6.2)	Frequency: # of Time Sampled/Yr (6.2)	Number of Samples per Sample Period (6.2)	Sample Plot &/or Sample Location # (6.2)	Notes/Other Information
Trace Elements	Sediment	May/Sep	ML-2	2	USGS	2	6	HFP,P2	HF=Hay Farm Pond, P2=Pond 2
Petroleum Prod/PAH's	Sediment	May	ML-3	1	USGS	1	1	HD,P2	HD=Hamp Ditch, P2=Pond 2
Salts/Sodium (Trona)	Birds	**	ML-2	2		**	**	**	
Pesticides	Birds	**	ML-2	1		**	**	**	

** Brains from bird carcasses recovered from the refuge would be analyzed for sodium concentrations and acetylcholinesterase depression.

WORKSHEET OM10

WORKSHEET OM11

CONTAMINANT ASSESSMENT AREA MONITORING ACTIVITIES
(Summary Data Sheet)

SL Name		Seedskadee NWR			Region	6	State	WY
Investigator's Name		Pedro Ramirez, Mike Bryant					Date	11/05/91
CAA Number	SDK 2	Location Description		Off Service Lands - Trona Wastewater Pond, La Barge Oil & Gas field				
Project Number		UTM Coordinates	E (Long)			N (Lat)		
Specific Purpose/Objectives		Monitor bird mortalities in waste pits/ponds & efforts of industry to prevent them.						

Contaminant to Monitor (from OM9)	Medium/Par. to Sample/ Measure (5.2)	When to Sample: Month/Time (5.3)	Contaminant Monitoring Level (6.2)	Contaminant Priority Level (OM9)	RFM & Method Section # (6.2)	Frequency: # of Time Sampled/Yr (6.2)	Number of Samples per Sample Period (6.2)	Sample Plot &/or Sample Location # (6.2)	Notes/Other Information
Salts/Sodium (Trona)	Birds*	Mar/Nov	M-1	1		2	**	RP-1	Rhone-Poulenc Trona Ponds
Petroleum Prod./PAH's	Birds*	Apr/Oct	M-1	1		2	**	LB-1	La Barge Oil Field
Pesticides	Birds*	*	M-3	1		*	*	*	
Trace Elements	Birds*	*	M-3	3		*	*	*	

* Bird Carcasses Recovered from Trona Wastewater Ponds, Oilfield Waste Pits or Die-offs on or near farmland would be submitted for necropsy, and trace element analysis. Brains would be analyzed for sodium concentrations and acetylcholinesterase depression.

WORKSHEET OM12

TEMPORAL CONSIDERATIONS FOR MONITORING

SL Name		Seedskadee NWR	Region	6	State	WY
CAA #	SDK 1	Investigator's Name	Pedro Ramirez, Mike Bryant		Date	11/05/91

Contaminant(s) or Parameter(s) being monitored	Transport Pathway or Medium	Optimum Time to Sample	Comments
Trace Elements (Boron)	Submerged Aquatic vegetation & sediment	May	Sample at Hay Farm Pond and Pond # 2
Sodium	bird carcasses	Mar, Oct/Nov	Analyzed bird carcasses recovered for sodium concentrations in brain tissue
Petroleum Products/PAH's	sediment	May	Sample sediments at Hamp Ditch & Pond # 2
Pesticides	Bird Carcasses	When mortality occurs	Recover bird carcasses and analyzed brain for acetylcholinesterase inhibition

Importance Ranking			1=high importance, 2=moderate importance, 3=low importance
GW	Air	SW	TEMPORAL CONSIDERATIONS
3	3	2	Storm events (pulses of contaminants)
			Seasonal/diurnal
3	3	2	wet vs. dry

3	3	3	temperature affects (DO, respiration, etc.)
2	3	2	agricultural activities (fertilizers, amount and type of pesticides, aerial spraying)
3	3	3	turnover period and stratification of standing water
3	3	1	biotic activities (life cycle, peak population numbers, hormonal cycles, migration, etc.)
3	2	3	wind intensity
3	3	2	storm intensity
3	1	2	wind direction
3	3	2	stagnation events
3	3	2	dryness (resuspension of particulates)
3	3	2	wet deposition vs. dry deposition
3	3	3	seasonal recharge (ground water level fluctuation and water available to sample at seeps or wells
3	2	2	recreational activities, increased tourism (auto emissions, hunting, fishing, etc.)
			Tidal/sea level rise
3	3	3	**Contaminant characteristics (persistence, toxicity, variability with temperature, DO, synergistic effects with other contaminants in system, etc.)**
3	3	2	**Estimates regarding inputs from air deposition and subsequent runoff (surface water pathway only)**
3	3	3	**Contaminant source characteristics (discharge pulses, change in the containants released)**

			Other

Additional Temporal Considerations

- Access to monitoring location
- Available labor
- When do other samples need to be collected at this, or other nearby locations
- Is sample equipment and storage space available
- Are appropriate funds and capabilities available for sample collection, transportaion, and analysis

WORKSHEET OM12 TEMPORAL CONSIDERATIONS FOR MONITORING

WORKSHEET OM13 LOGISTICS AND COSTS FOR CONTAMINANT MONITORING ACTIVITIES

SL Name	Seedskadee NWR	Region	6	State	WY
Investigator's Name	Pedro Ramirez, Mike Bryant	CAA #		Date	
Project #	Project Title				
Specific Purpose/Objectives					

Contaminant to Monitor (from OM11)	Medium to be Collected for Sample Analysis (OM11)	Personnel / Training Needed? (Y/N) (6.3)	Total Number of Samples per Year (6.3)	Type of Analysis (6.3)	Analysis Cost per Sample (6.3)	Total Sample Analysis Costs	Total Materials Costs	Total Equipment Costs	Total Training Costs	TOTAL COSTS
Trace Elements (Boron)	Sediment	N	12	Routine Chemical	215	2,580.00	36			2,616.00
Trace Elements (Boron)	Aquatic Vegetation	N	6	Routine Chemical	215	1,290.00	10			1,300.00
Petroleum Products/PAH's	Sediment	N	6	Routine Chemical	273	1,638.00	20			1,658.00
Petroleum Products/PAH's	Birds*	Y	3	Bile PAH Scan	273	819.00	10			829.00
Salts/Sodium (Trona Impacts)	Birds*	Y	3	Brain Sodium Analyses	50	150.00	10			160.00
Pesticides	Birds*	Y	3	Brain ChE	50	150.00	10			160.00

Personnel/Training Needs:	Train Refuge Personnel in Protocol for Handling Bird Carcasses and processing for necropsy and chemical analyses
Material/Equipment Needs:	Sample Jars
Other Comments:	* Bird carcasses recovered from die-off incidents and submitted for analyses. Estimate a minimum of 3 carcasses recovered.