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Adonia Henry

Adonia Henry

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APPENDIX A

1 Hydraulic Analysis Overview

A hydraulic analysis of the Green River through Seedskadee National Wildlife Refuge was completed for flow rates of: 5,000 cfs; 14,000 cfs; 17,000 cfs; 20,000 cfs; and 25,000 cfs. The analysis utilized Light Detection and Ranging (LiDAR) for the elevation data. ArcMap and HEC-GeoRAS used the LiDAR data to create the input data for HEC-RAS. HEC-RAS computed the water surface elevations for the various flows. Finally, HEC-RAS created the output which was used as an input to ArcMap to create flooding maps.

2 HEC-RAS Description

HEC-RAS is software from the U.S. Army Corps of Engineers' Hydrologic Engineering Center's River Analysis System. HEC-RAS performs hydraulic calculations for natural and constructed channels. HEC-RAS contains four analysis components for: steady flow water surface profile computations; unsteady flow simulation; movable boundary sediment transport computations; and water quality analysis (Brunner, 2010).

The Seedskadee analysis is limited to the steady flow water surface profile computations only, which computes water surface elevation for a constant flow rate at all points in the river. Multiple flow rates were analyzed, however only one flow rate was analyzed in each run, rather than changing the flow rate at different points along the river.

The computational procedure is based on the solution of the one-dimensional energy equation. This entails calculating energy losses by Manning's equation and contraction/expansion. The effects of various obstructions such as bridges, culverts, weirs, levees, spillways and other structures in the flood plain may be considered in the computations (Brunner 2010).

3 HEC-GeoRAS Description

HEC-GeoRAS is an ArcGIS® extension designed to process geospatial data (i.e. LiDAR) for use with HEC-RAS. The tools allow users to create an HEC-RAS import file containing geometric attribute date from existing terrain models. Water surface profile results created by HEC-RAS may also be processed to visualize inundation depths and boundaries (Ackerman 2009).

4 Manning Equation Discussion

As described above, HEC-RAS utilizes Manning's equation to compute water surface elevations. Manning's equation is dependent upon: 1) the cross sectional shape of the river; 2) the surface roughness of the channel and; 3) the slope of the water surface.

The cross sectional area of the river can be accurately modeled for the areas that were *above* water at the time of the LiDAR survey only. LiDAR does not penetrate water, so the cross sectional area of the river *beneath* the water surface at the time of the LiDAR survey must be approximated.

The cross section of the river was approximated by modifying the LiDAR data in ArcMap. This was accomplished by first identifying the edge of the water. The line defining the edge of the water was then offset in towards the middle of the river a distance of 3 meters (9.8 ft) horizontally on both sides of the river. All LiDAR points between this offset line and the water edge were lowered 0.3 meters (1 ft). Next, the line defining the edge of the water was offset in towards the middle of the river a distance of 5 meters (16.4 ft) horizontally on both sides of the river. All LiDAR points between these offset lines were lowered a distance of 1 meter (3.3 ft). The figure below shows the original channel from the LiDAR data, as well as the approximated channel.

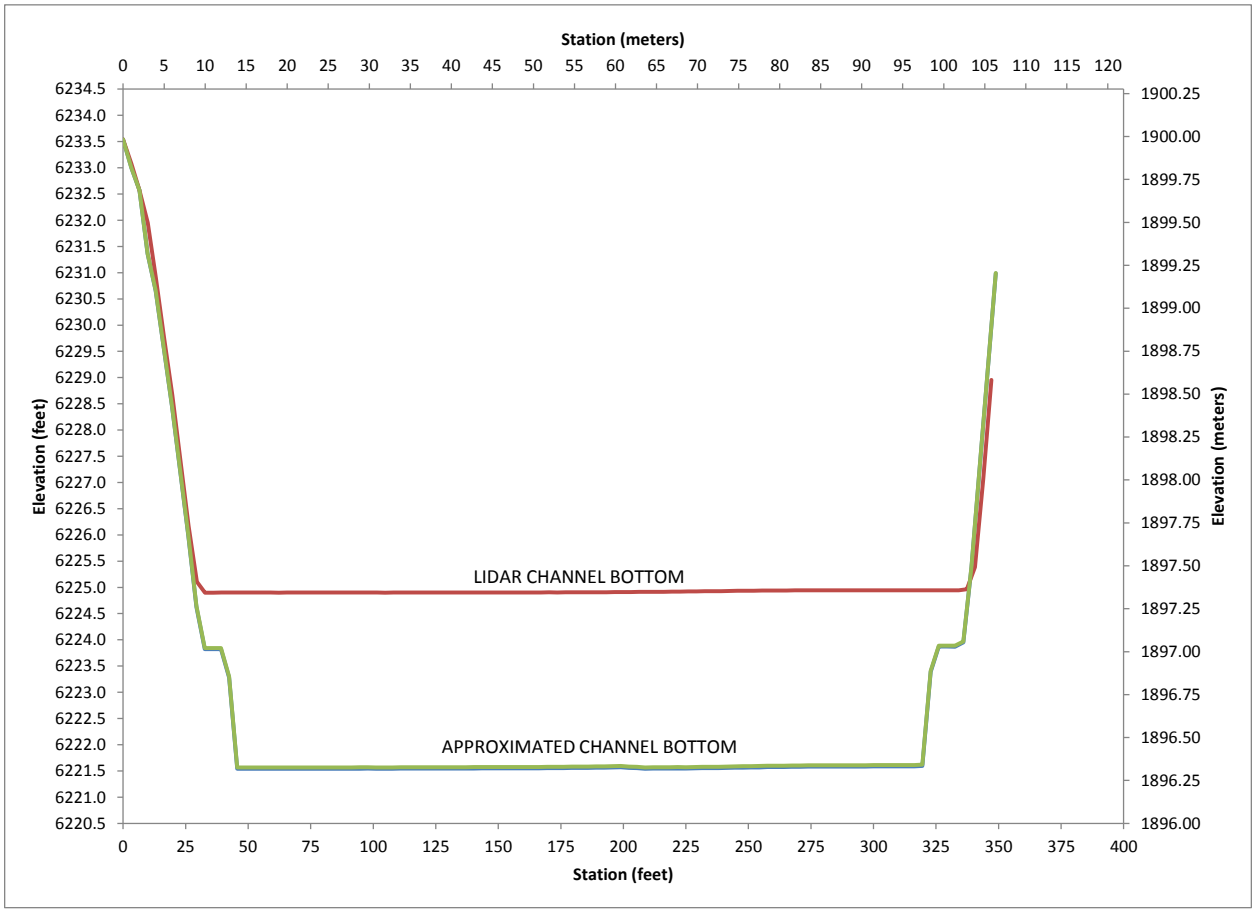

Figure 4-1: River Cross Section modifications for HEC-RAS modeling

The surface roughness of the channel, also known as manning's value, varies greatly along a river reach and with different stages of flow. Channels with heavy vegetation have more surface roughness than a grass channel for example. The roughness of a channel can also vary throughout the year, as the height of vegetation will increase the surface roughness. For this modeling effort, Manning's number for the channel was set to 0.039. Manning's number for the floodplain was set to 0.05.

Knowing that the cross sectional shape cannot be perfectly modeled, and that the exact channel roughness cannot be perfectly modeled is important in evaluating the results of HEC-RAS. For example a 17,000 cfs flow may flood a significantly different area if the flood occurs during the summer or winter.

The HEC-RAS results shown are associated with a specific flow rate (i.e. 14,000 or 17,000 cfs), however it must be understood that the results are produced with average surface roughness values and an approximate river channel, therefor actual flood inundation may be above or below the results shown.

5 Modeling Results Discussion

The output of the HEC-RAS was compared to historical aerial imagery during floods and during base flows. The areas HEC-RAS predicted to be flooded appeared very similar to historical flooding images. The LiDAR data proved to be extremely beneficial to accurately map the areas that are inundated by flooding. Although the area of inundation shown is associated with specific flows, it is understood that the exact extent of flooding will likely vary. It may be useful to create flooding classifications such as minor, moderate, and extreme which correlate to a range of flows.

5.1 Recommended Modeling Improvements

Although the results are very useful, there are modifications to the model than can be completed if more detail is required.

Additional survey information should be collected for the areas within the channel that could not be penetrated by LiDAR. In order to collect the amount of data necessary to pair with the LiDAR data, an extremely labor intensive ground survey can be completed. Alternatively, LiDAR can be flown during an extreme drought event. Or, there are LiDAR technologies that are becoming more common that can penetrate water.

In addition to the survey modifications, HEC-RAS can model hydraulic features such as: 1) levees; 2) varied flows; 3) bridges; and 4) split flows. These capabilities were not utilized as it was determined the results produced accurately reflected historical aerial photography.

5.1.1 Levees

HEC-RAS will assume that the water surface across a cross section is constant. For example, if there is a ditch that parallels the river, it will assume that the water level in the ditch is the same level as the river. This assumption typically is valid, except in cases where the ditch is not connected to the river on the upstream or downstream end of the ditch. For example if the ditch has been plugged, or if stoplogs are in place, then the ditch may not be correctly modeled. Using the levee tools in HEC-RAS can be used to model these areas more accurately.

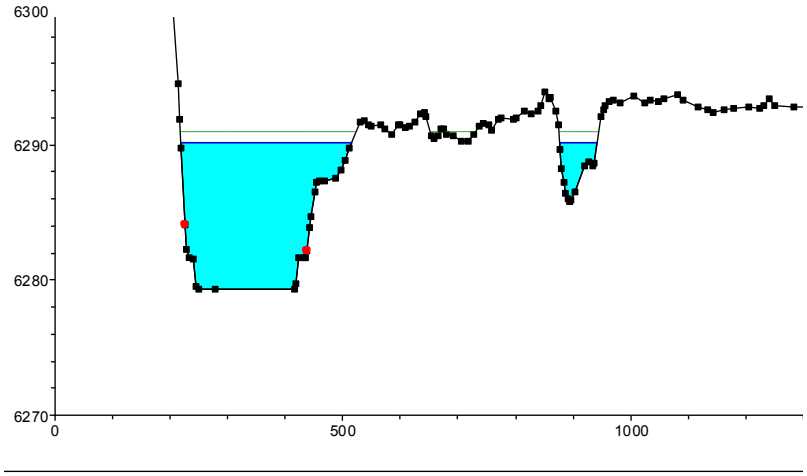

Figure 5-1: Cross section showing flow in parallel ditch

5.1.2 Varied Flow

The hydraulic analysis was a steady state analysis, in that one flow rate was modeled throughout the entire river. If it is determined that the flow rates increase downstream due to tributaries that enter the river, or if it is determined that the flow rates decrease downstream due to withdrawals, then an unsteady flow simulation can be computed.

5.1.3 Bridges

There are two bridges that cross the Green River in this reach. It was determined that the bridges did not significantly impact the water profile and the effects of the bridges would be limited to an area immediately adjacent to the bridge, so the bridge analysis was not completed. Multiple cross sections were samples around the bridge, so it is unlikely the results would change significantly.

5.1.4 Split Flow

Similar to the discussion regarding levees, HEC-RAS can accurately model river splits. For example where there is an island (i.e. Big Island or Telephone Island) the river splits and flows around the island. It is possible that the water surface across the cross section is not exactly level, and it would be more accurate to model the river as a river split rather than using a single cross section.

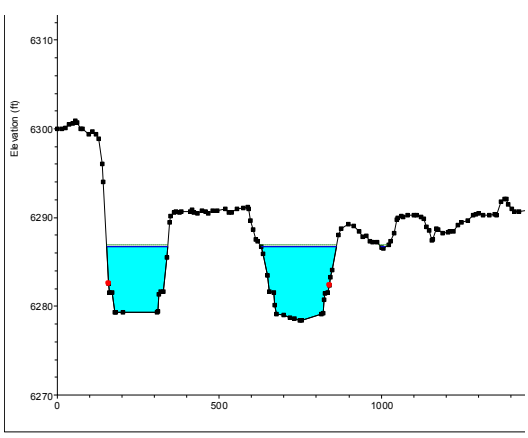

Figure 5-2: Cross section showing split flow

6 Lower Hawley Analysis

The Lower Hawley area is a good area to illustrate the uses of HEC-RAS as well as the limitations.

Lower Hawley is an area with extensive dike construction and ditch construction within the floodplain.

Figure 6-1: 2009 Aerial Image showing ditches (in blue) and levees (in yellow)

This is an area that appears to have had water in the pools which are formed from the ditches and dikes at the time of the LIDAR survey.

Figure 6-2: LIDAR elevation map

Looking at a profile of the LIDAR data for the portion of the Hawley Unit, it is apparent the LIDAR data reflects the top of the pools (flat surfaces), rather than the "real" ground.

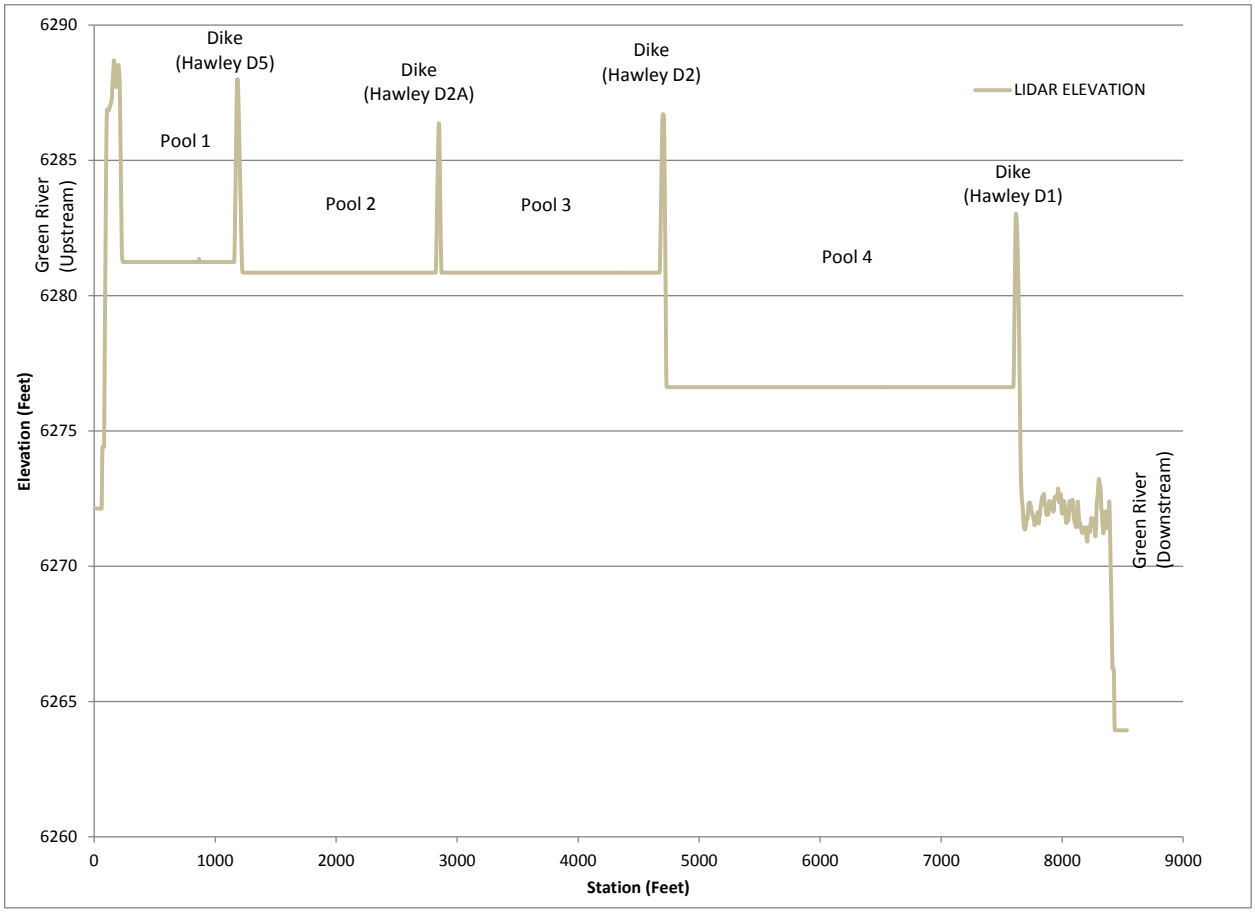

Figure 6-3: LIDAR Profile of Off-Channel Pools at Hawley Unit

The HEC-RAS model results for a moderate flood (approximately 14,000)show the following inundated areas. As can be seen from the HEC-RAS inundation map, the downstream (south) end of many pools are not inundated.

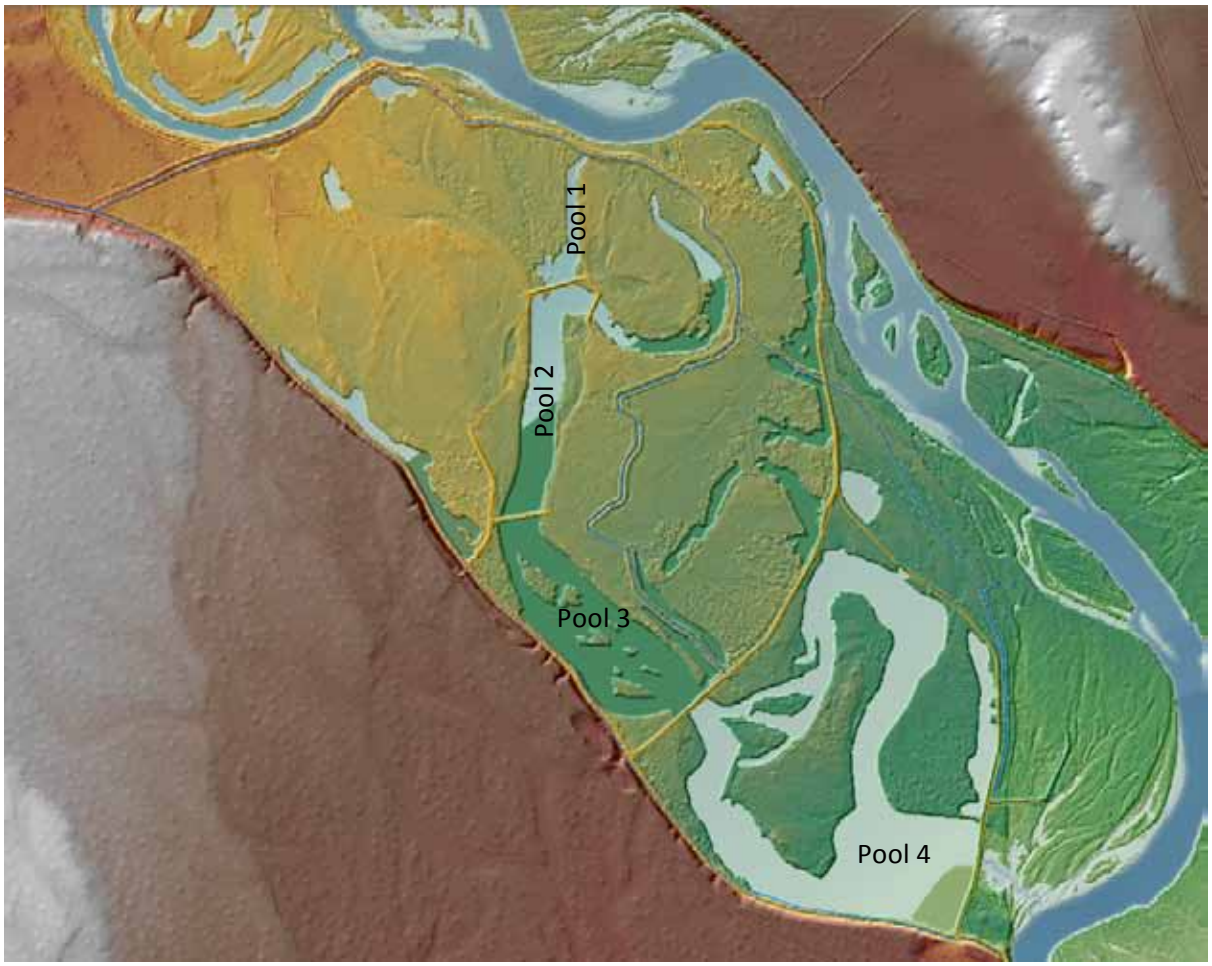

Figure 6-4: Lower Hawley Inundation Map (dark blue indicate deep water, light blue indicates shallow water)

Only the upper portions of the off-channel ponds appear to be flooded because the LIDAR results show the elevation of the land above the calculated water surface elevation from HEC-RAS. The profile below shows the calculated water surface as well as the LIDAR elevations. Notice on the lower ends of the ponds, the LIDAR elevation is above the water surface.

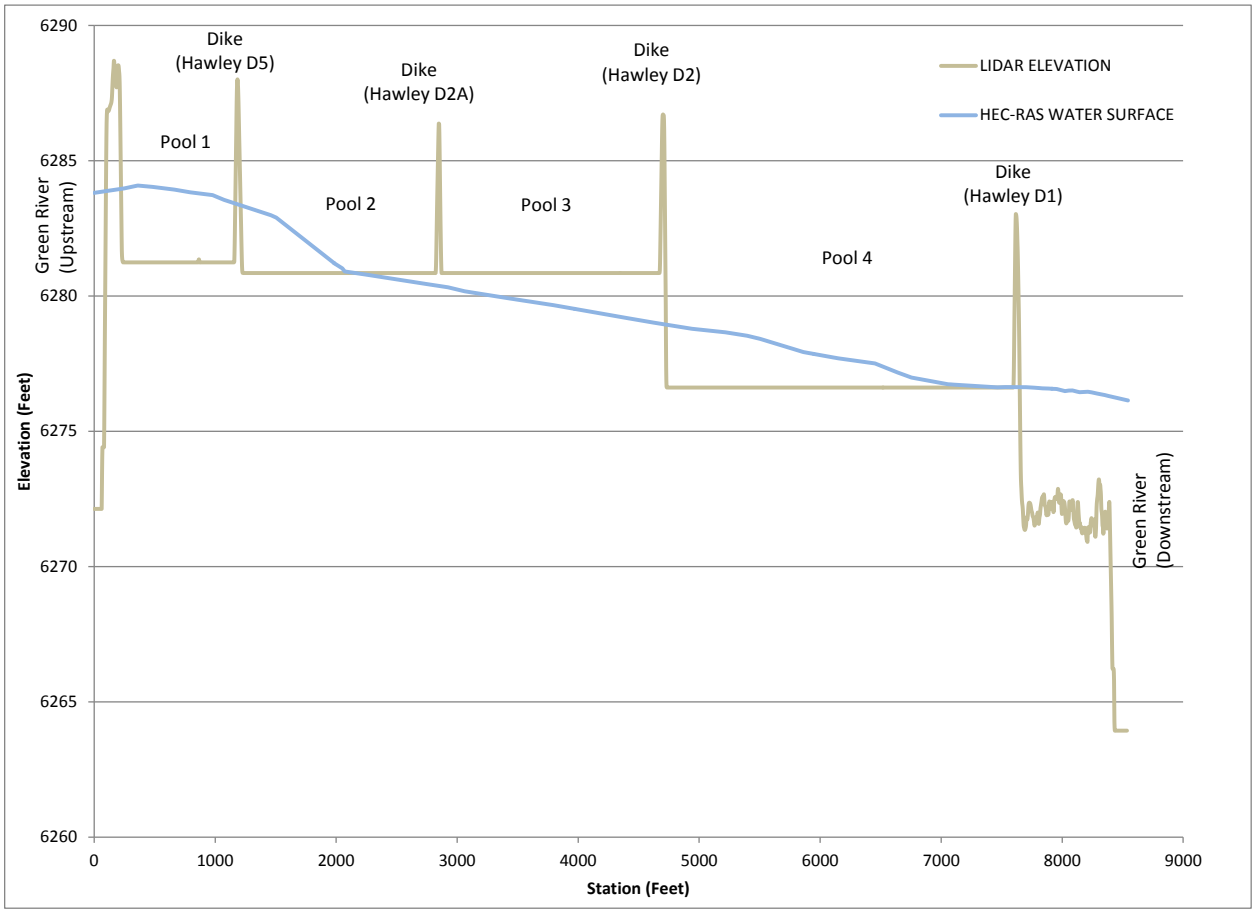

Figure 6-5: LIDAR and Water Surface in Off-Channel Ponds at Hawley Unit

In order to correctly model the Hawley unit, the pools that were filled with water would need to be resurveyed. An approximate “real” ground surface, would look similar to the following graph.

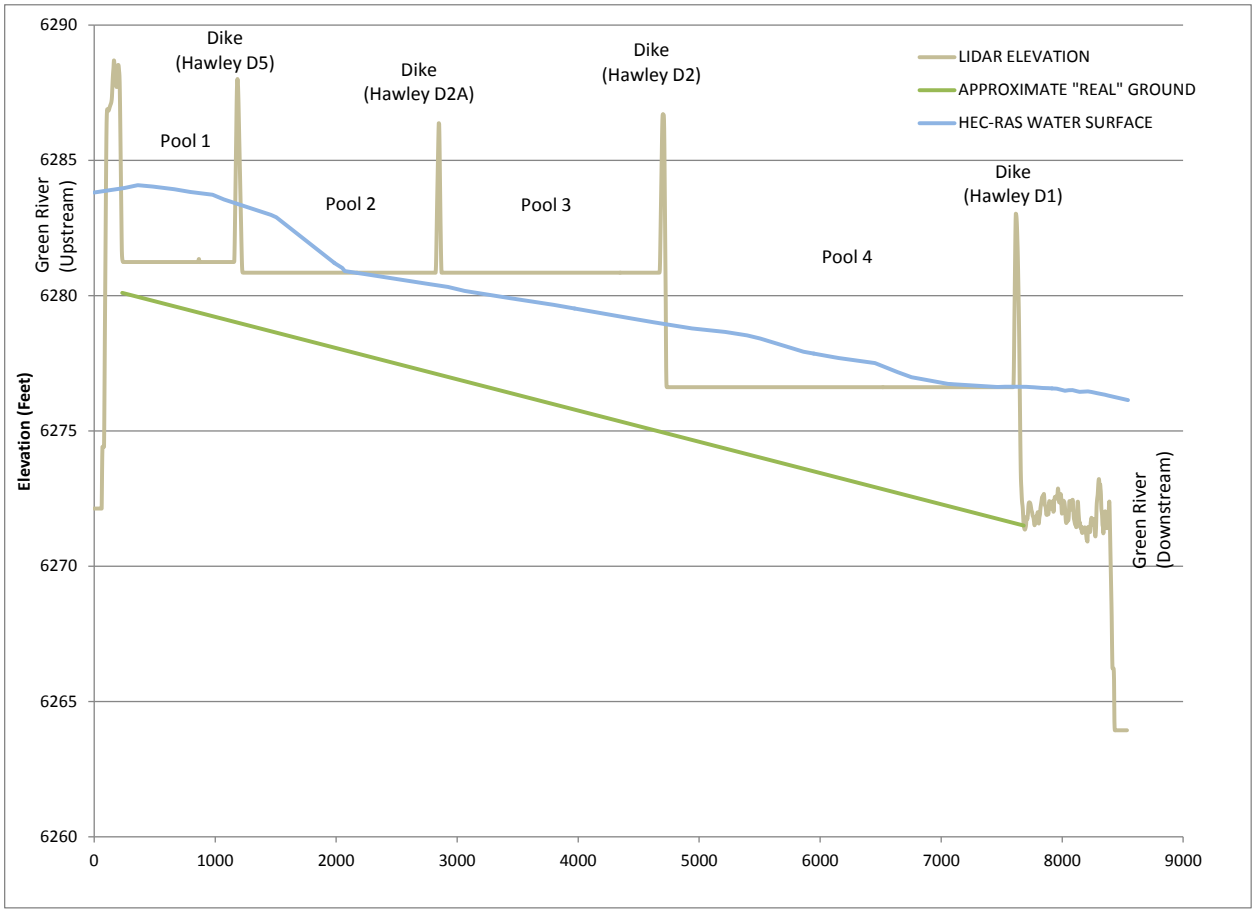

Figure 6-6: LIDAR, Water Surface, and Approximate "Real" Ground in Off-Channel Ponds at Hawley Unit

In the above graph, the water surface would be more of a constant depth of approximately 3-4 feet, rather than the depth of 0-3 feet calculated by HEC-RAS.

In order to accurately model these ponds that were filled during the LIDAR survey, it would be beneficial to resurvey these areas and re-run the HEC-RAS model.

In addition, these off-channel areas should be carefully evaluated for times when HEC-RAS predicts flooding. There may be a moderate flood occurring in the main channel, but if the infrastructure prevents water from entering the ponds, these areas may be dry during a flood even though the HEC-RAS analysis predicts flooding. This is an example of the levee function of HEC-RAS, where flooding outside the main channel will occur only if a certain threshold is reached, which would push water over the top of the levees.

Appendix B. Vegetation species expected to occur in vegetation community types on Seedskadee National Wildlife Refuge. For status, N=native, I=introduced/invasive, and I*=noxious weed designated by the State of Wyoming. For growth type, A=annual, B=biennial, and P=perennial.

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
FERN ALLIES										
Equisetaceae (Horsetails)										
Smooth Horsetail	*Equisetum laevigatum*		x		x				N	P
MONOCOTS										
Alismataceae										
Broadlead arrowhead	*Sagittaria latifolia*		x	x	x				N	P
Amaryllidaceae										
Wild Onion	*Allium textile*						x	x	N	P
Cyperaceae (Sedges)										
Douglas' Sedge	*Carex douglasii*		x		x	x	x	x	N	P
Woolly Sedge	*Carex pellita*		x		x	x	x		N	P
Nebraska Sedge	*Carex nebrascensis*				x				N	P
Clustered Field Sedge	*Carex praegracilis*		x		x	x			N	P
Northwest Territory Sedge	*Carex utriculata*		x	x	x				N	P
Short-beaked/ Analogue Sedge	*Carex simulata*		x	x	x	x			N	P
Common Spikerush	*Eleocharis palustris*		x	x	x	x			N	P
Hardstem/Tule Bulrush	*Schoenoplectus acutus*		x	x					N	P
Common threesquare	*Schoenoplectus pungens*		x	x					N	P
Iridaceae										
Rocky Mountain Iris	*Iris missouriensis*		x		x				N	P
Blue-eyed Grass	*Sisyrinchium* spp.		x		x				N	P
Juncaceae (Rushes)										
Baltic Rush	*Juncus arcticus*		x		x	x			N	P
Juncaginaceae										
Seaside Arrowgrass	*Triglochin maritima*		x	x	x	x			N	P
Lilaceae										
Sego Lily	*Calochortus nuttallii*						x	x	N	P
Starry Solomon's Seal	*Maianthemum stellatum*		x		x				N	P
Najadaceae										
Naiads	*Najas* sp.								N	A
Poaceae (Grasses)										
Crested Wheatgrass	*Agropyron cristatum*						x	x	I	P
Bluebunch Wheatgrass	*Pseudoroegneria spicata*				x		x	x	N	P
Redtop, Bentgrass	*Agrostis gigantea*				x		x		I	P
Shortawn Foxtail	*Alopecurus aequalis*		x		x				N	P
Creeping Foxtail	*Alopecurus arundinaceus*		x		x	?			I	P
Meadow Foxtail	*Alopecurus pratensis*		x		x		x		I	P
American Sloughgrass	*Beckmannia syzigachne*		x	x	x				N	A
Smooth Brome	*Bromus inermis*				x		x		I	P

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Cheatgrass	*Bromus tectorum*						x	x	I	A
Northern Reedgrass	*Calamagrostis stricta*		x		x				N	P
Tufted Hairgrass	*Deschampsia cespitosa*				x				N	P
Inland Saltgrass	*Distichlis spicata*					x			N	P
Basin Wildrye	*Leymus cinereus*				x		x	x	N	P
Intermediate Wheatgrass	*Thinopyrum intermedium*				x		x	x	I	P
Quackgrass	*Elymus repens*						x	x	I*	P
Western Wheatgrass	*Pascopyrum smithii*					x		x	N	P
Slender Wheatgrass	*Elymus trachycaulus*				x	x	x	x	N	P
Meadow Fescue	*Schedonorus pratensis*				x		x	?	I	P
Galleta	*Pleuraphis jamesii*					x	x	x	N	P
Foxtail Barley	*Hordeum jubatum*					x			N	P
Scratchgrass	*Muhlenbergia asperifolia*		x		x	x			N	P
Mat Muhly	*Muhlenbergia richardsonis*		x		x	x	x		N	P
Indian Ricegrass	*Achnatherum hymenoides*					x	x	x	N	P
Reed Canarygrass	*Phalaris arundinacea*		x	x	x				N/I	P
Timothy	*Phleum pratense*		x		x		x	x	I	P
Common Reed	*Phragmites australis*		x	x					N	P
Alkali/Sandberg Bluegrass	*Poa secunda*					x	x	x	N	P
Kentucky Bluegrass	*Poa pratensis*		x		x		x	x	I	P
Bottlebrush squirreltail	*Elymus elymoides*						x	x	N	P
Alkali Cordgrass	*Spartina gracilis*		x			x			N	P
Alkali Sacaton	*Sporobolus airoides*					x	x	x	N	P
Needle and Thread	*Hesperostipa comata*						x	x	N	P
Potamogetonaceae										
Pondweeds	*Potamogeton* sp.	x		x					N	P
Narrow-leaved pondweeds	*Stuckenia* sp.	x		x					N	P
Typhaceae										
Broadleaf Cattail	*Typha latifolia*		x	x					N	P
DICOTS - FORBS										
Apiaceae										
Water Hemlock	*Cicuta maculata*		x	x	x				N	P
Plains Spring-parsley	*Cymopterus glomeratus*							x	N	P
Longstalk Springparsley	*Cymopterus longipes*							x	N	P
Asclepiadaceae										
Showy Milkweed	*Asclepias speciosa*		x		x		x		N	P
Asteraceae										
Russian Knapweed	*Acroptilon repens*		x		x		x	x	I*	P
Pale Agoseris	*Agoseris glauca*				x		x		N	P

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Littleleaf Pussytoes	*Antennaria parvifolia*		x				x	x	N	P
Tarragon Sagewort	*Artemisia dracunculus*		x				x	x	N	P
Louisiana Wormwood/ White Sagebrush	*Artemisia ludoviciana*		x		x		x	x	N	P
Pacific or Western Aster	*Symphyotrichum ascendens*						x	x	N	P
Musk Thistle	*Carduus nutans*		x		x	x	x	x	I*	A,B
Spotted Knapweed	*Centaurea stoebe*						x	x	I*	B,P
Canada Thistle	*Cirsium arvense*		x		x	x	x	x	I*	P
Elk Thistle	*Cirsium foliosum*				x		x	x	N	P
Bull Thistle	*Cirsium vulgare*		x		x		x		I	B
Dandelion Hawksbeard	*Crepis runcinata*		x		x		x	x	N	P
Smooth Fleabane	*Erigeron glabellus*							x	N	B,P
Low Fleabane	*Erigeron pumilus*							x	N	P
Curlycup Gumweed	*Grindelia squarrosa*		x			x	x	x	N	A,B,P
Stemless Goldenweed	*Stenotus acaulis*						x	x	N	P
Lanceleaf Goldenweed	*Pyrrocoma lanceolata*		x		x		x	x	N	P
Nuttall Goldenweed/ Rayless Tansyaster	*Xanthisma grindelioides*							x	N	P
Common Sneezeweed	*Helenium autumnale*		x		x				N	P
Fineleaf Hymenopappus	*Hymenopappus filifolius*						x	x	N	P
Poverty Weed	*Iva axillaris*					x	x	x	N	P
Prickly Lettuce	*Lactuca serriola*						x	x	I	A,B
Skeletonplant	*Lygodesmia grandiflora*		x		x		x	x	N	P
Purple Aster/ Hoary Tansyaster	*Dieteria canescens*						x	x	N	A,B,P
Water Groundsel/ Water Ragwort	*Senecio hydrophilus*		x		x	x			N	B,P
Missouri Goldenrod	*Solidago missouriensis*						x	x	N	P
Marsh Sow-thistle	*Sonchus arvensis* ssp. *uliginosus*		x		x		x		I*	P
Spiny Sow-thistle	*Sonchus asper*		x		x		x		I	A
False Sagebrush/ Silver Chicken-sage	*Sphaeromeria argentea*							x	N	P
Common Dandelion	*Taraxacum officinale*		x		x		x	x	N/I	P
Hoary Townsend Daisy	*Townsendia incana*							x	N	A,B,P
Common Cocklebur	*Xanthium strumarium*		x		x	x	x	x	N	A
Boraginaceae										
Roughseed Cryptantha	*Cryptantha flavoculata*							x	N	P
Silky Cryptantha	*Cryptantha sericea*							x	N	B,P
Western Sticktight	*Lappula occidentalis*						x	x	N	A

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Narrow-leaf Gromwell	*Lithospermum incisum*						x	x	N	P
Nuttall's Crinklemat	*Tiquilia nuttallii*							x	N	A
Brassicaceae										
Holboell's Rockcress	*Arabis holboellii*							x	N	B,P
Hoary Cress	*Cardaria draba*		x		x	x	x	x	I*	P
Longstalk Whitetop	*Cardaria pubescens*		x		x	x	x	x	I*	P
Pinnate Tansy-mustard	*Descurainia pinnata*						x	x	N	A,B
Flixweed Tansy-mustard	*Descurainia sophia*						x	x	I	A,B
Halimolobos	*Halimolobos virgata*						x	x	N	B,P
Tall Whitetop/ Pepperweed	*Lepidium latifolium*		x	x	x	x	x	x	I*	P
Clasping Pepperweed	*Lepidium perfoliatum*						x	x	I	A,B
Alpine Bladderpod	*Lesquerella alpina*							x	N	P
Foothill Bladderpod	*Lesquerella ludoviciana*						x	x	N	P
Malcolmia	*Malcolmia africana*							x	I	A
Sharpleaf Twinpod	*Physaria acutifolia*							x	N	P
Bluntleaf Yellowcress	*Rorippa curvipes*		x		x				N	A,P
Spreading Yellowcress	*Rorippa sinuata*		x		x				N	P
Flaxleaf Plainsmustard	*Schoenocrambe linifolia*						x	x	N	P
Capparaceae										
Yellow beeplant	*Cleome lutea*		x		x		x	x	N	A
Caryophyllaceae										
Hooker Sandwort	*Arenaria hookeri*							x	N	P
Baby's Breath	*Gypsophila paniculata*		x				x	x	I	P
Ceratophyllaceae										
Coontail	*Ceratophyllum demersum*	x		x					N	P
Chenopodiaceae										
Oakleaf Goosefoot	*Chenopodium glaucum*		x	x	x	x			I	A
Slimleaf Goosefoot	*Chenopodium leptophyllum*						x	x	N	A
Saltlover/Common Halogeton	*Halogeton glomeratus*						x	x	I	A
Kochia	*Kochia scoparia*		x		x		x	x	I	A
Poverty-weed	*Monolepis nuttalliana*		x			x			N	A
Rocky Mountain Glasswort	*Salicornia rubra*					x			N	A
Russian Thistle	*Salsola tragus*						x	x	I	A
Convolvulaceae										
Field Bindweed	*Convolvulus arvensis*		x				x	x	I*	P
Euphorbiaceae										
Horned/Rocky Mountain Spurge	*Euphorbia brachycera*							x	N	P
Ridgeseed Spurge	*Chamaesyce glyptosperma*						x	x	N	A

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Fabaceae										
Purple/Field Milkvetch	*Astragalus agrestis*				x		x	x	N	P
Silver-leafed Milkvetch	*Astragalus argophyllus*					x		x	N	P
Canada Milkvetch	*Astragalus canadensis*					x		x	N	P
Cicada Milkvetch	*Astragalus chamaeleuce*							x	N	P
Lesser Rushy Milkvetch	*Astragalus convallarius*							x	N	P
Geyer's Milkvetch	*Astragalus geyeri*							x	N	A,B
Green River Milkvetch	*Astragalus pubentissimus*							x	N	A,B,P
Woollypod Milkvetch	*Astragalus purshii*						x	x	N	P
Tufted Milkvetch	*Astragalus spatulatus*						x	x	N	P
Looseflower Milkvetch	*Astragalus multiflorus*							x	N	P
American Licorice	*Glycyrrhiza lepidota*		x				x		N	P
Silvery Lupine	*Lupinus argenteus*		x				x	x	N	P
Rusty Lupine	*Lupinus pusillus*		x				x	x	N	A
Alfalfa	*Medicago sativa*				x		x	x	I	P
White Sweet-clover	*Melilotus albus*		x		x		x	x	I	A,B,P
Yellow Sweet-clover	*Melilotus officinalis*		x		x		x	x	I	A,B,P
Drop-pod Locoweed	*Oxytropis deflexa*		x		x		x		N	P
River Oxytrope	*Oxytropis riparia*		x						I	P
Silky Crazyweed	*Oxytropis sericea*		x				x	x	N	P
Lemon Scurfpea	*Psoralidium lanceolatum*							x	N	P
Swaison Pea	*Sphaerophysa salsula*					x	x	x	I	P
Intermountain Clover	*Trifolium andinum*							x	N	P
American Vetch	*Vicia americana*		x		x	x	x	x	N	P
Hippuridaceae										
Common Marestail	*Hippuris vulgaris*	x	x	x					N	P
Hydrophyllaceae										
Leafy Nama	*Nama densum*							x	N	A
Lamiaceae										
Field/Wild Mint	*Mentha arvensis*		x		x				N	P
False Dragonhead	*Physostegia parviflora*		x		x				N	P
Malvaceae										
Scarlet Globemallow	*Sphaeralcea coccinea*						x	x	N	P
Nyctaginaceae										
Narrowleaf four o'clock	*Mirabilis linearis*						x	x	N	P
Snowball Sand Verbena	*Abronia fragrans*						x	x	N	P
Sandpuffs	*Tripterocalyx micranthus*						x	x	N	A
Onagraceae										
Small Evening Primrose	*Camissonia minor*							x	N	A

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Barestem Evening Primrose	*Camissonia scapoidea*							x	N	A
Scarlet Gaura	*Gaura coccinea*						x		N	P
Tufted Evening Primrose	*Oenothera caespitosa*						x	x	N	P
Hooker's Evening Primrose	*Oenothera elata* ssp. *hirsutissima*		x				x	x	N	B,P
Hairycalyx/Pale Evening Primrose	*Oenothera pallida*						x	x	N	B,P
Hairy Evening Primrose	*Oenothera villosa*		x		x		x	x	N	B,P
Orobanchaceae										
Clustered Broomrape	*Orobanche fasciculata*						x	x	N	A
Plantaginaceae										
Redwood Plantain	*Plantago eriopoda*					x			N	P
Broadleaf Plantain	*Plantago major*		x				x	x	I	P
Polemoniaceae										
Hood's Phlox	*Phlox hoodii*						x	x	N	P
Sand Gilia	*Aliciella leptomeria*						x	x	N	A
Common Ball-head Gilia	*Ipomopsis congesta*						x	x	N	P
Prickly Phlox	*Leptodactylon pungens*							x	N	P
Polygonaceae										
Nodding Buckwheat	*Eriogonum cernuum*						x	x	N	A
Cushion Buckwheat	*Eriogonum ovalifolium*						x	x	N	P
Prostrate Knotweed	*Polygonum aviculare*		x		x	x	x	x	I	A,P
Curly Dock	*Rumex crispus*		x		x		x		I	P
Canaigre Dock	*Rumex hymenosepalus*		x			x	x		N	P
Golden Dock	*Rumex maritimus*		x		x				N	A,B
Primulaceae										
Sea Milkwort	*Glaux maritima*					x			N	P
Ranunculaceae										
Alkali Buttercup	*Ranunculus cymbalaria*		x		x	x			N	P
Rosaceae										
Common Silverweed	*Argentina anserina*		x		x				N	P
Woolly Cinquefoil	*Potentilla hippiana*				x		x	x	N	P
Santalaceae										
Bastard Toadflax	*Comandra* sp.		x				x	x	N	P
Scrophulariaceae										
Indian Paintbrush	*Castilleja angustifolia*						x	x	N	P
Bushy Bird's Beak	*Cordylanthus ramosus*		x		x		x	x	N	A
Sand Penstemon	*Penstemon arenicola*							x	N	P
Fuzzytongue Penstemon	*Penstemon eriantherus*						x	x	N	P
Fremont's Beardtongue	*Penstemon fremontii*							x	N	P
Water Speedwell	*Veronica anagallis-aquatica*	x	x						I	P

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Solanaceae										
Black Henbane	*Hyoscyamus niger*						x	x	I	A,B
Buffalobur Nightshade	*Solanum rostratum*						x	x	I	A
Valerianaceae										
Edible Valeriana/ Tobacco Root	*Valeriana edulis*				x		x		N	P
Verbenaceae										
Prostrate Vervain	*Verbena bracteata*		x		x		x	x	N	A,B,P
DICOTS - TREES & SHRUBS										
Asteraceae										
Fringed Sagebrush	*Artemisia frigida*						x	x	N	P
Black Sagebrush	*Artemisia nova*							x	N	P
Bud Sagebrush	*Picrothamnus desertorum*						x	x	N	P
Big Sagebrush	*Artemisia tridentata*							x	N	P
Green Rabbitbrush	*Lorandersonia linifolia*							x	N	P
Rubber Rabbitbrush	*Ericameria nauseosa*							x	N	P
Snakeweed	*Gutierrezia sarothrae*							x	N	P
Gray horsebrush	*Tetradymia canescens*							x	N	P
Cottonthorn horsebrush	*Tetradymia spinosa*							x	N	P
Anacardiaceae										
Skunkbush/ Fragrant Sumac	*Rhus trilobata*						x	x	N	P
Betulaceae										
Water Birch	*Betula occidentalis*		x						N	P
Cactaceae										
Prickly Pear Cactus	*Opuntia* sp.						x	x	N	P
Pincushion Cactus	*Pediocactus simpsonii*						x	x	N	P
Chenopodiaceae										
Shadscale Saltbush	*Atriplex confertifolia*							x	N	P
Gardner's Saltbush	*Atriplex gardneri*						x	x	N	P
Spiny Hopsage	*Grayia spinosa*						x	x	N	P
Black Greasewood	*Sarcobatus vermiculatus*							x	N	P
Cornaceae										
Red-osier	*Cornus sericea*		x		x				N	P
Elaeagnaceae										
Silverberry/Wolf Willow	*Elaeagnus commutata*		x						N	P
Russian Olive	*Elaeagnus angustifolia*		x		x	x	x		I	P
Silver Buffaloberry	*Shepherdia argentea*		x		x		x	x	N	P

Common Name	Scientific Name	Habitats							Status	Growth Type
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		
Grossulariaceae										
Wax/Golden Currant	*Ribes aureum*		x		x		x	x	N	P
Missouri/ Redshoot Gooseberry	*Ribes oxyacanthoides* ssp. *setosum*		x						N	P
Polemoniaceae										
Granite Prickly Phlox	*Leptodactylon pungens*						x	x	N	P
Polygonaceae										
Umbrella Plant/ Shortstem Buckwheat	*Eriogonum brevicaule*		x		x		x	x	N	P
Rosaceae										
Wood's Rose	*Rosa woodsii*		x						N	P
Salicaceae										
Narrowleaf Cottonwood	*Populus angustifolia*		x						N	P
Bebb Willow	*Salix bebbiana*		x						N	P
Coyote Willow	*Salix exigua*		x			x			N	P
Whiplash Willow	*Salix lucida* ssp. *caudata*		x						N	P
Solanaceae										
Matrimony Vine/ Chinese Boxthorn	*Lycium barbarum*		x						I	P
Tamaricaceae										
Salt Cedar	*Tamarix ramosissima*		x						I*	P

Karen Kyle

Appendix C. Fish, amphibian and reptile, mammal, and bird species expected to occur in vegetation community types on Seedskadee National Wildlife Refuge.

Common Name	Scientific Name	Habitats								
		Wetland					Upland			
		River	Ripar-ian	Emer-gent	Wet Meadow	Saline Playa	Grass-land	Sage-brush		Other
FISH										
Rainbow Trout*	*Oncorhynchus mykiss*	x								
Brown Trout*	*Salmo trutta*	x								
Lake Trout*	*Salvelinus namaycush*	x								
Snake River Cutthroat Trout*	*Oncorhynchus clarki ssp.*	x								
Bear River Cutthroat Trout*	*Oncorhynchus clarki utah*	x								
Colorado River Cutthroat Trout***	*Oncorhynchus clarki pleuriticus*	x								
Kokanee Salmon*	*Oncorhynchus nerka*	x								
Mountain Whitefish	*Prosopium williamsoni*	x								
Channel Catfish*	*Ictalurus punctatus*	x								
Smallmouth Bass*	*Micropterus dolomieu*	x								
Colorado Pikeminnow***	*Ptychocheilus lucius*	x								NR
Mottled Sculpin	*Cottus bairdii*	x								
White Sucker*	*Catostomus commersonii*	x								
Mountain Sucker	*Catostomus platyrhynchus*	x								
Flannelmouth Sucker***	*Catostomus latipinnis*	x								
Bluehead Sucker***	*Catostomus discobolus*	x								
Razorback Sucker***	*Xyrauchen texanus*	x								NR
Common Carp*	*Cyprinus carpio*	x								
Utah Chub*	*Gila atraria*	x								
Roundtail Chub***	*Gila robusta*	x								
Humpback Chub***	*Gila cypha*	x								NR
Bonytail Chub***	*Gila elegans*	x								NR
Bonneville Redside Shiner*	*Richardsonius balteatus hydrophlox*	x								
Fathead Minnow*	*Pimephales promelas*	x								
Speckled Dace	*Rhinichthys osculus*	x								
AMPHIBIANS										
Northern Leopard Frog***	*Lithobates pipiens*			x	x		x			
Boreal Chorus	*Pseudacris triseriata*		x	x	x	x	x			
Great Basin Spadefoot***	*Spea intermontana*		x					x		
Tiger Salamander	*Ambystoma tigrinum*		x	x	x	x	x	x		
REPTILES										
Many-lined Skink	*Eumeces multivirgatus*						x	x		Rocky
Northern Sagebrush Lizard	*Sceloporus graciosus graciosus*							x		MMS

	Northern Plateau Lizard***	*Sceloporus undulates elongatus*								x		Rocky Cany.
	Eastern Short-horned Lizard	*Phrynosoma douglassii brevirostre*							x	x		Rocky
	Eastern Yellow-bellied Racer	*Coluber constrictor flaviventris*		x		x	x		x	x		
	Great Basin Gopher Snake	*Pituophis catenifer deserticola*		x	x	x	x		x	x		
	Wandering Western Terrestrial Garter	*Thamnophis elegans vagrans*		x	x	x			x			
	Western Plains Garter Snake	*Thamnophis radix haydenies*		x		x	x		x			
BIRDS												
Gaviiformes												
	Common Loon***	*Gavia immer*	x		x							
Podicipediformes												
	Horned Grebe	*Podiceps auritus*	x		x							
	Eared Grebe	*Podiceps nigricollis*			x							
	Pied-billed Grebe	*Podylimbus podiceps*	x		x							
	Western Grebe***	*Aechmophorus occidentalis*			x							
	Clark's Grebe***	*Aechmorphorus clarkii*			x							
Pelicaniformes												
	American White Pelican***	*Pelecanus erythrorhynchos*	x		x							
	Double-crested Cormorant	*Phalacrocorax auritus*	x	x	x							
Ciconiformes												
	American	*Botaurus lentiginosus*			x							
	Great Blue Heron	*Ardea herodias*	x	x	x							
	Great Egret	*Ardea alba*	x	x	x	x						
	Snowy Egret***	*Egretta caerulea*		x	x	x						
	Cattle Egret	*Bubulcus ibis*	x	x	x	x	x		x			
	Black-crowned Night Heron***	*Nycticorax nycticorax*	x	x	x	x	x					
	White-faced	*Plegadis chihi*			x	x	x					
Anseriformes												
	Trumpeter Swan***	*Cygnus buccinator*	x	x	x	x						
	Tundra Swan	*Cygnus columbianus*	x	x	x	x						
	Canada Goose	*Branta canadensis*	x	x	x	x						
	Ross's Goose	*Chen rossi*			x	x						
	Lesser Snow Goose	*Chen caerulescens caerulescens*			x	x						
	Wood Duck	*Aix sponsa*	x	x	x							
	Mallard	*Anas platyrhunchos*	x	x	x	x	x		x	x		
	Gadwall	*Anas strepera*			x	x	x					
	Northern Pintail	*Anas acuta*			x	x	x					
	American Wigeon	*Anas americana*		x	x	x			x	x		
	Northern Shoveler	*Anas clypeata*			x	x	x		x	x		
	Cinnamon Teal	*Anas cyanoptera*			x	x	x					
	Blue-winged Teal	*Anas discors*			x	x	x					
	Green-winged	*Anas crecca*		x	x	x	x		x	x		
	Canvasback	*Aythya valisineria*	x		x							
	Redhead	*Aythya americana*	x		x		x					
	Ring-necked Duck	*Aythya collaris*	x		x							
	Lesser Scaup	*Aythya affinis*	x		x	x			x	x		

	Long-tailed Duck	*Clangula hyemalis*	x									
	Common Goldeneye	*Bucephala clangula*	x		x							
	Barrow's Goldeneye	*Bucephala islandica*	x	x	x							
	Bufflehead	*Bucephala albeola*	x		x							
	Hooded Merganser	*Lophodytes cucullatus*	x	x	x							
	Common Merganser	*Mergus merganser*	x	x	x							
	Red-breasted Merganser	*Mergus serrator*	x	x								
	Ruddy Duck	*Oxyura jamaicensis*	x		x							
Falconiformes												
	Turkey Vulture	*Cathartes aura*	x	x	x	x	x		x	x		Rocky
	Northern Harrier	*Circus cyaneus*	x	x	x	x	x		x	x		
	Sharp-shinned Hawk	*Accipiter striatus*		x						x		
	Cooper's Hawk	*Accipiter coperii*		x						x		
	Northern Goshawk***	*Accipiter gentillis*		x						x		
	Swainson's Hawk***	*Buteo swainsoni*		x		x	x		x	x		
	Red-tailed Hawk	*Buteo jamaicensis*		x	x	x	x		x	x		
	Ferruginous Hawk***	*Buteo regalis*		x	x	x	x		x	x		
	Rough-legged Hawk	*Buteo lagopus*		x	x	x	x		x	x		
	Golden Eagle	*Aquilla cyrysaetos*	x	x	x	x	x		x	x		Cany.
	Bald Eagle***	*Haliaeetus leucocephalus*	x	x	x	x	x		x	x		
	Osprey	*Pandion haliaetus*	x	x	x							
	Merlin***	*Falco columbarius*		x	x	x	x		x	x		
	American Kestrel	*Falco sparverius*				x	x		x	x		
	Prairie Falcon	*Falco mexicanus*				x	x		x	x		Cliff
	Peregrine Falcon***	*Falco peregrinus*	x	x	x	x	x		x	x		MMS
Galliformes												
	Greater Sage-grouse***	*Centrocercus urophasianus*		x		x	x		x	x		
Gruiformes												
	American Coot	*Fulica americana*	x		x							
	Common	*Gallinula chloropus*			x							
	Virginia Rail	*Rallus limicola*			x	x	x					
	Sora	*Porzana carolina*			x	x	x					
	Sandhill Crane	*Grus canadensis*		x	x	x	x		x	x		
	Whooping	*Grus americana*			x	x	x		x			
Charadriiformes												
	Black-bellied Plover	*Pluvialis squatarola*		x		x	x					Rocky
	Semipalmated Plover	*Charadrius semipalmatus*		x		x	x					
	Killdeer	*Charadrius*				x	x					Rocky
	Mountain	*Charadrius montanus*					x		x	x		
	American Avocet	*Recurvirostra americana*		x	x	x	x		x			
	Black-necked Stilt	*Himantopus mexicanus*			x	x	x					
	Greater	*Tringa melanoleuca*	x	x	x	x	x					

	Lesser Yellowlegs	*Tringa flavipes*	x	x	x	x	x					
	Solitary Sandpiper	*Tringa solitaria*		x		x	x					
	Willet	*Tringa semipalmata*	x			x			x			
	Spotted	*Actitis macularia*	x	x	x	x	x		x	x		
	Upland Sandpiper	*Bartramia longicauda*							x	x		
	Long-billed Curlew***	*Numenius americanus*				x	x		x			
	Marbled Godwit	*Limosa fedoa*			x	x	x		x			
	Semipalmated Sandpiper	*Calidris pusilla*			x	x	x					
	Western Sandpiper	*Calidris mauri*			x	x	x					
	Least Sandpiper	*Calidris minutilla*		x	x	x	x					
	Baird's Sandpiper	*Calidris bairdii*	x	x	x	x	x					
	Pectoral	*Calidris melanotos*		x		x	x		x			
	Stilt Sandpiper	*Calidris himantopus*			x	x	x					
	Short-billed Dowitcher	*Limnodromus griseus*		x	x	x	x		x			
	Long-billed Dowitcher	*Limnodromus scolopaceus*		x		x	x					
	Common Snipe	*Gallinago gallinago*		x	x	x	x					
	Wilson's Phalarope***	*Phalaropus tricolor*			x	x	x		x			
	Red-necked Phalarope	*Phalaropus lobatus*			x	x	x					
	Franklin's Gull	*Leucophaeus*				x	x		x			
	Bonaparte's Gull	*Chroicocephalus philadelphia*	x	x	x	x						
	Ring-billed Gull	*Larus delawarensis*	x	x	x	x						
	California Gull	*Larus californicus*	x	x	x	x	x		x	x		
	Herring Gull	*Larus argentatus*	x	x								
	Caspian Tern***	*Hydroprogne caspia*	x	x	x							
	Common Tern	*Sterna hirundo*	x	x	x							
	Forster's Tern***	*Sterna forsteri*		x	x							
	Black Tern***	*Chlidonias niger*	x	x	x	x	x					
Columbiformes												
	Mourning Dove	*Zenaida macroura*		x	x	x	x		x	x		
	Rock Pigeon*	*Columbia livia*							x	x		MMS Cliff
Cuculiformes												
	Yellow-billed Cuckoo***	*Coccyzus americanus*		x								
Strigiformes												
	Long-eared Owl	*Asio otus*		x	x	x	x		x	x		
	Short-eared	*Asio flammeus*			x	x	x		x	x		
	Great-horned Owl	*Bubo virginianus*		x	x	x	x		x	x		Cliff
	Snowy Owl	*Bubo scandiacus*			x	x	x		x	x		
	Northern Saw-whet Owl	*Aegolius acadicus*		x								
	Burrowing Owl***	*Athene cunicularia*				x	x		x	x		
Caprimulgiformes												
	Common Nighthawk	*Chordeiles minor*	x	x	x	x	x		x	x		Rocky
	Common Poorwill	*Phalaenoptilus*				x	x		x	x		

Apodiformes												
	White-throated Swift	*Aeronautes saxatalis*			x	x	x		x	x		Cliff Cany.
	Black-chinned Hummingbird	*Archilochus alexandri*		x					x	x		
	Calliope hummingbird***	*Stellula calliope*		x								
	Broad-tailed hummingbird	*Selasphorus platycercus*		x								
	Rufous hummingbird	*Selasphorus rufus*		x		x	x		x	x		
Coraciformes												
	Belted Kingfisher	*Megaceryle alcyon*	x	x								
Piciformes												
	Lewis's Woodpecker***	*Melanerpes lewis*		x								
	Red-headed Woodpecker	*Melanerpes erythrocephalus*		x								
	Yellow-bellied Sapsucker	*Sphyrapicus varius*		x								
	Red-naped Sapsucker	*Sphyrapicus nuchalis*		x								
	Downy Woodpecker	*Picoides pubescens*		x								
	Hairy Woodpecker	*Picoides villosus*		x								
	Northern Flicker	*Colaptes auratus*		x								
Passeriformes												
	Olive-sided Flycatcher	*Contopus cooperi*		x								
	Western Wood-pewee	*Contopus sordidulus*		x								
	Cordilleran Flycatcher	*Empidonax occidentalis*		x								
	Willow Flycatcher	*Empidonax traillii*		x								Cany.
	Gray Flycatcher	*Empidonax wrightii*		x						x		
	Hammond's Flycatcher	*Empidonax hammondii*		x						x		
	Dusky Flycatcher	*Empidonax oberholseri*		x						x		
	Least Flycatcher	*Empidonax minimus*		x								
	Say's Phoebe	*Sayornis saya*		x		x	x		x	x		MMS Cany.
	Western Kingbird	*Tyrannus verticalis*		x		x	x		x	x		MMS
	Eastern Kingbird	*Tyrannus tyrannus*		x					x	x		
	Horned Lark	*Eremophila alpestris*				x	x		x	x		
	Northern Shrike	*Lanius excubitor*		x		x	x		x	x		
	Loggerhead Shrike***	*Lanius ludovicianus*		x		x	x		x	x		
	Red-eyed Vireo	*Vireo olivaceus*		x								
	Warbling Vireo	*Vireo gilvus*		x								
	Plumbeous Vireo	*Vireo plumbeus*		x								
	Blue Jay	*Cyanocitta cristata*		x								
	Clark's Nutcracker	*Nucifraga*		x								
	Black-billed Magpie	*Pica hudsonia*		x	x	x	x		x	x		MMS
	American Crow	*Corvus brachyrhynchos*		x	x	x	x		x	x		MMS
	Common Raven	*Corvus corax*		x	x	x	x		x	x		Cliff MMS

	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	x	x	x	x	x		x	x		Cliff MMS
	Bank Swallow	*Riparia ripiria*	x	x	x	x	x		x	x		
	Violet-green Swallow	*Tachycineta thalassina*	x	x						x		
	Tree Swallow	*Tachycineta bicolor*	x	x	x	x	x		x			
	Cliff Swallow	*Petrochelidon pyrrhonota*		x	x	x	x		x	x		Cliff MMS
	Barn Swallow	*Hirundo rustica*			x	x	x		x	x		MMS
	Mountain Chickadee	*Poecile gambeli*		x								
	Black-capped Chickadee	*Poecile atricapillus*		x								
	Red-breasted Nuthatch	*Sitta canadensis*		x						x		
	White-breasted Nuthatch	*Sitta carolinensis*		x						x		
	Brown Creeper	*Certhia americana*		x								
	Rock Wren	*Salpinctes obsoletus*							x	x		Cliff Rocky
	Bewick's Wren	*Thryomanes bewickii*		x						x		
	House Wren	*Troglodytes aedon*		x								
	Marsh Wren	*Cistothorus palustris*			x							
	Rudy-crowned Kinglet	*Regulus calendula*		x								
	Blue-gray Gnatcatcher	*Polioptila caerulea*		x								
	Townsend's Solitaire	*Myadestes townsendi*		x								
	Mountain Bluebird	*Sialia currucoides*				x	x		x	x		
	American Robin	*Turdus migratorius*		x		x	x		x	x		MMS
	Veery	*Catharus fuscescens*		x								
	Swainson's	*Catharus ustulatus*		x								
	Hermit Thrush	*Catharus guttatus*		x						x		
	Gray Catbird	*Dumetella carolinensis*		x						x		
	Northern Mockingbird	*Mimus polyglottos*		x		x	x		x	x		MMS
	Sage Thrasher	*Oreoscoptes montanus*								x		
	Brown Thrasher	*Toxostoma rufum*		x						x		
	European	*Sturnus vulgaris*				x	x		x	x		MMS
	American Pipit	*Anthus rubescens*	x			x	x		x			
	Bohemian Waxwing	*Bombycilla garrulus*		x								
	Cedar Waxwing	*Bombycilla cedrorum*		x						x		
	Tennessee	*Oreothlypis peregrina*		x								
	Nashville Warbler	*Oreothlypis ruficapilla*		x						x		
	Orange-crowned Warbler	*Oreothlypis celata*		x								
	Virginia's Warbler***	*Oreothlypis virginiae*		x								
	Yellow Warbler	*Dendroica petechia*		x						x		
	Chestnut-sided Warbler	*Dendroica pensylvanica*		x						x		
	Magnolia Warbler	*Dendroica magnolia*		x								
	Yellow-rumped Warbler	*Dendroica coronata*		x								

	Pine Warbler	*Dendroica pinus*		x								
	American	*Setophaga ruticilla*		x								
	Northern Waterthrush	*Parkesia noveboracensis*		x	x							
	MacGillivray's Warbler	*Oporornis tolmiei*		x								
	Common Yellowthroat	*Geothlypis trichas*		x	x	x	x		x			
	Wilson's Warbler	*Wilsonia pusilla*		x						x		
	Yellow-breasted Chat	*Icteria virens*		x								
	Western Tanager	*Piranga ludoviciana*		x		x			x	x		
	Rose-breasted Grosbeak	*Pheucticus ludovicianus*		x						x		
	Black-headed Grosbeak	*Pheucticus melanocephalus*		x								Cany.
	Lazuli Bunting	*Passerina amoena*		x						x		
	Indigo Bunting	*Passerina cyanea*		x					x	x		Cany.
	Dickcissel	*Spiza americana*				x			x			
	Green-tailed Towhee	*Pipilo chlorurus*		x						x		
	Spotted Towhee	*Pipilo maculatus*		x						x		
	American Tree Sparrow	*Spizella arborea*		x	x	x	x		x	x		MMS
	Chipping Sparrow	*Spizella passerina*		x		x	x		x	x		
	Brewer's Sparrow***	*Spizella breweri*								x		
	Vesper Sparrow	*Pooecetes*				x	x		x	x		
	Lark Sparrow	*Chondestes grammacus*		x		x	x		x	x		
	Sage Sparrow***	*Amphispiza belli*								x		
	Lark Bunting	*Calamospiza melanocorys*							x	x		
	Savannah Sparrow	*Passerculus sandwichensis*				x	x		x			
	Grasshopper Sparrow	*Ammodramus savannarum*				x	x		x	x		
	Fox Sparrow	*Passerella iliaca*		x								
	Song Sparrow	*Melospiza melodia*		x	x							
	Lincoln's Sparrow	*Melospiza lincolnii*		x								
	Harris's Sparrow	*Zonotrichia querula*		x		x			x	x		
	White-crowned Sparrow	*Zonotrichia leucophrys*		x		x	x		x	x		
	Dark-eyed Junco	*Junco hyemalis*		x					x	x		
	McCown's Longspur***	*Rhynchophanes mccownii*				x	x		x			
	Lapland Longspur	*Calcarius lapponicus*				x	x		x			
	Chestnut-collared Longspur***	*Calcarius ornatus*					x		x			
	Snow Bunting	*Plectrophenax nivalis*	x			x	x		x			
	Western Meadowlark	*Sturnella neglecta*				x	x		x	x		
	Bobolink***	*Dolichonyx oryzivorus*			x	x	x					
	Brown-headed Cowbird	*Molothrus ater*		x	x	x	x		x	x		
	Yellow-headed Blackbird	*Xanthocephalus xantheocephalus*			x	x	x					
	Red-winged Blackbird	*Agelaius phoeniceus*		x	x	x	x					

	Rusty Blackbird	*Euphagus carolinus*		x	x	x			x			
	Brewer's Blackbird	*Euphagus cyanocephalus*		x	x	x	x		x	x		
	Common Grackle	*Quiscalus quiscula*		x	x							
	Bullock's Oriole	*Icterus bullockii*		x								
	Evening Grosbeak	*Coccothraustes vespertinus*		x						x		
	Gray-crowned Rosy- Finch	*Leucosticte tephrocotis*							x	x		
	Black Rosy-Finch***	*Leucosticte atrata*							x	x		
	Pine Grosbeak	*Pinicola enucleator*		x								
	Cassin's Finch	*Carpodacus cassinii*		x								
	House Finch*	*Carpodacus mexicanus*		x					x	x		MMS
	Pine Siskin	*Spinus pinus*		x		x	x		x	x		
	Common Redpoll	*Acanthis flammea*		x					x	x		
	American Goldfinch	*Spinus tristis*		x		x	x		x			
MAMMALS												
Insectivora												
	Vagrant Shrew	*Sorex vagrans*		x								
	Merriam's Shrew	*Sorex merriami*		x		x	x		x	x		
	Northern Water Shrew	*Sorex palustris albibarbis*	x	x								
	Masked Shrew	*Sorex cinereus*		x		x						
	Montane Shrew	*Sorex monticolus*		x		x			x			
Chiroptera												
	Western Small-footed Myotis	*Myotis ciliolabrum*	x	x	x	x	x		x	x		Cliff
	Western Long-eared Myotis***	*Myotis evotis*	x	x	x	x	x		x	x		Cliff MMS
	Townsend's Big-eared Bat***	*Corynorhinus townsendii*				x	x		x	x		NR
	Little Brown Bat	*Myotis lucifugus*	x	x	x	x	x		x	x		Cliff MMS
	Long-legged Myotis	*Myotis volans*	x	x	x	x	x		x	x		Cliff MMS
	Hoary Bat	*Lasiurus cinereus*	x	x	x	x	x		x	x		
	Big Brown Bat	*Eptesicus fuscus*	x	x	x	x	x		x	x		Cliff MMS
	Silver-haired Bat	*Lasionycteris noctivagans*	x	x	x	x	x		x	x		MMS
	Pallid Bat***	*Antrozous pallidus*				x	x		x	x		Cliff

Rodentia												
	Least Chipmunk	*Tamias minimus*		x		x	x		x	x		
	Yellow-bellied Marmot	*Marmota flaviventris*				x	x		x	x		Rocky
	Golden-mantled Ground Squirrel	*Spermophilus lateralis*							x	x		
	Uinta Ground Squirrel	*Spermophilus armatus*							x	x		
	Wyoming Ground Squirrel	*Spermophilus elegans*							x	x		
	Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*							x			
	White-tailed Prairie Dog***	*Cynomys leucurus*								x		
	Northern Pocket Gopher	*Thomomys talpoides*		x		x						
	Olive-backed Pocket Mouse	*Perognathus fasciatus*							x	x		
	Great Basin Pocket Mouse	*Perognathus parvus*					x		x	x		
	Ord's Kangaroo Rat	*Dipodomys ordii*					x		x	x		Sandy
	Beaver	*Castor canadensis*	x	x	x							
	Deer Mouse	*Peromyscus maniculatus*		x		x	x		x	x		
	Northern Grasshopper Mouse	*Onychomys leucogaster*				x	x		x	x		
	Bushy-tailed Woodrat	*Neotoma cinerea*										Rocky
	Montane Vole	*Microtus montanus*		x		x	x		x	x		
	Long-tailed Vole	*Microtus longicaudus*		x		x			x			
	Meadow Vole	*Microtus pennsylvanicus*		x	x	x			x			
	Sagebrush Vole	*Lemmiscus curtatus*							x	x		
	Muskrat	*Ondatra zibethicus*	x	x	x							
	Western Jumping Mouse	*Zapus princeps*		x		x			x			
	Porcupine	*Erethizon dorsatum*		x					x	x		
Lagomorpha												
	White-tailed Jackrabbit	*Lepus townsendii*				x	x		x	x		
	Desert Cottontail	*Sylvilagus audubonii*							x	x		
	Pygmy Rabbit***	*Brachylagus idahoensis*								x		

Carnivora												
	Coyote	*Canis latrans*		x	x	x	x		x	x		
	Red Fox	*Vulpes vulpes*		x	x	x	x		x	x		
	Swift Fox***	*Vulpes velox*							x	x		NR
	Black Bear	*Ursus americanus*		x								
	Short-tailed Weasel or Ermine	*Mustela erminea*		x		x	x		x	x		
	Long-tailed Weasel	*Mustela frenata*		x		x	x		x	x		
	Mink	*Mustela vison*	x	x	x							
	Black-footed Ferret***	*Mustela nigripes*							x	x		NR
	American Badger	*Taxidea taxus*				x	x		x	x		
	Striped Skunk	*Mephitis mephitis*				x	x		x	x		MMS
	Raccoon	*Procyon lotor*		x	x	x						
	River Otter***	*Lutra canadensis*	x	x	x							
	Bobcat	*Lynx rufus*		x					x	x		
Artiodactyla												
	Moose	*Alces americanus*		x	x	x						
	Elk	*Cervus elaphus*		x		x			x	x		
	Mule Deer	*Odocoileus*		x		x	x		x	x		
	Pronghorn	*Antilocapra americana*				x	x		x	x		

* = introduced/non-native

*** = species of concern (from WY Natural Diversity Database and also includes SOC defined by TNC and PIF; does WY "species of potential concern" unless a SOC species by TNC or PIF)

Karen Kyle