§ 5.6 (d)(3)(v) – Wildlife and Botanical Resources Including Invasive Species

(v) Wildlife and botanical resources. A description of the wildlife and botanical resources, including invasive species, in the project vicinity. Components of this description must include:

Since the project will not establish a reservoir above the high tide level of Half-Moon Cove, impacts on terrestrial habitat will not exist except for possible impacts on birds and other species which live in and feed off the intertidal zone; however, since the modified tidal regime within Half-Moon Cove will be very similar to natural conditions, this impact is not considered as being significant except at the actual dam site. The PAD will still include information assembled during the due diligence portion of this investigation in order to meet FERC standards.

For a rockfill dam, the footprint area would experience an extensive change from an intertidal and submerged environment into a permanently covered habitat. At a later time, an additional need exists to quantify impacts of wildlife and botanical resources depending on the location of the raw material for project construction under non-FERC standards; however, these effects will not occur within the project boundary.

The previous section included some information which seems to overlap some of the objectives of this section. The only permanent impact on habitat within the water column refers to the "low spring tide zone" due to the transformation of sometimes intertidal zones into permanently submerged terrain.

Interconnection with the local public utility will occur along an existing transmission corridor and will not create any impacts on wildlife and botanical resources.

A map of the project area which was provided by Maine Department of Inland Fisheries and denoted as Figure HMC-23 appears at the end of this section to identify the location of a bald eagle nest in the project area.

Results of Soft Substrate Recolonization Studies Including Location, Stressor, and Time to Recovery

Study	Location	Stressor	Time to Recovery
Germano *et al.* 1994	Coastal New England	Dredged material Disposal	6months–1 year
Rosenberg 1971	Sweden	Paper mill (sulfite)	3 years
Rosenberg 1976	Sweden	Enrichment	5 years
Murray and Saffert 1999	Western Long Island Sound	Dredged material disposal	1–4 months
Kropp et al. 1999	Massachusetts Bay	Storms	1 2 years
Rhoads *et al.* 1978	Long Island Sound	Dredged material Disposal	1–? years
Rhoads *et al.* 1978	Long Island Sound	Azoic sediment	6–8 months

TABLE HMC-07: RECOLONIZATION STUDY [*repeated*]

This type of reference material refers to the work being proposed at the entrance to Half-Moon Cove and, possibly, at the causeway which might be breached to allow the installation of filling / emptying gates.

Wading birds are less common than shorebirds, but great blue heron are commonly sighted in Half Moon Cove. In the 1993, "An Ecological Assessment and Landscape Analysis of the Cobscook Bay Region," Norman Famous and Marcia Spencer report that Carlow Island is a safe, isolated resting area for terns, gulls, cormorants, and great blue herons. They further state that the extensive intertidal mudflats and algal beds in Half Moon Cove and adjacent Passamaquoddy Bay areas are used extensively by gulls, terns, and herons, but that migratory shorebird numbers are lower than in the 1970s and early 1980s (Famous and Spencer, 1993).

3.1.4.4 Coastal and Marine Avifauna

Steve Crawford of the Passamaquoddy Tribe, provided information to Quoddy Bay in 2006 on resource concerns of the Passamaquoddy Tribe, that included the identification of several listed marine bird species as threatened or endangered under the federal or state of Maine, within the LNG Terminal facility vicinity. Species identified by Crawford that are listed as endangered included, roseate tern (federal), least tern, golden eagle, American pipit and peregrine falcon. The only avian species listed at the LNG terminal site that the USFWS identified are transient bald eagles, which are discussed in Section 3.2.4. The least tern is a very rare visitor as there is no appropriate habitat in the project area (Famous 2006), the golden eagle is a rare migrant and winter visitor only and the American pipit is listed as endangered as a breeder only and pipits in the project area are migrants (Famous, 2006). The peregrine falcon breeds in more interior portions of Maine, and would be infrequent in the project area.

Species listed as threatened included the bald eagle (federal), razorbill, Atlantic puffin, Harlequin duck and Arctic tern. Correspondence from the USFWS regarding the Project area did not include a similar list of species (USFWS, 2006). MDIFW (Tudor, 2000) lists the status and occurrence of shorebirds birds in the state which includes piping plover as endangered. However, there is no appropriate piping plover habitat in the project area (Famous, 2006), Quoddy Bay has included the species identified by Crawford but not by federal agencies, in our overall assessment of the Project within this Resource Report, but have not included them within the Biological Evaluation in 3-J.

3.1.4.4.1 Federally Listed Species

3.1.4.4.1.1 Roseate Tern (Endangered)

The roseate tern (*Sterna dougallii*) is a medium-sized marine tern weighing about 3.5 oz (100g), with a wingspan of 27.6 inches (70 cm). It is pale in color with a black-capped head, and an

exceptionally long, deeply forked, white tail. The underside of an adult roseate tern is white with a tinge of pink that gives the bird its name. At birth, their legs and feet are black but as they mature they turn orange. The color of the bill changes over the course of the year. During the incubation period the bill develops an orange-red base. It then turns black around the time the young fledge (Cormons, 1976).

The roseate tern has a wide global distribution with four distinct nesting areas. These include the islands of the Caribbean Sea, the northwest Atlantic Ocean from Long Island and north to the Gulf of St. Lawrence, several islands in the Azores, and in northeastern Europe. In 1987 the USFWS determined that the northwest Atlantic population of roseate tern to be endangered and the Caribbean population to be threatened. This decline in population is mainly the result of habitat destruction and a decrease in nesting areas due to increasing numbers of larger and more aggressive marine birds.

In Maine, the roseate tern has been documented on only 22 of the 3,500 islands of its coast (MDIFW, 2003). They are usually spotted during post breeding and pre-migration periods. They will travel over 50 km round trip from their nesting areas in Massachusetts to roosting sites along the coast of Maine and its islands (USFWS, 2001). The roseate terns that live in the northwest Atlantic are almost always found in mixed colonies with the common and Artic Terns. The similarity in the appearance of these three birds makes it difficult to collect clear and distinct observations on the roseate tern.

In the nesting areas, which extend from Long Island, NY to Nova Scotia and the Gulf of St. Lawrence, they will build nests and lay between 1 and 2 eggs. Both of the parents care for the eggs and young. Throughout their stay in the northwestern Atlantic they make numerous foraging excursions. The majority of the roseate terns diet consists of small fish, especially sandlance (*Ammodytes sp.*). They also prey on herring (*Clupea harengus, Alosa aestivalis),* anchovies (*Anchoa* spp), mackerel (*Scomber scombrus*), and silversides (*Menidia menidia*). On rare occasions when fish prey are scarce, they also feed on squid and crustaceans. They forage using a plunge-diving technique, where they will dive from heights of up to 40 feet and completely immerse themselves in order to catch their prey. They most frequently feed in areas with shallow sandbars or over schools of predatory fish that drive prey to the surface.

The migration patterns of the roseate tern are not well detailed. They may travel in mixed flocks to the Caribbean or South America. It is common that they may remain there for up to two years before returning to the nesting grounds and breeding. Northward migrating birds arrive in the northeastern U.S. in late April to early May. During the southward migration, large numbers congregate at Monomoy National Wildlife Refuge (Massachusetts) from August to early September and most depart the northeastern U.S. by mid-September. Roseate terns winter in the region from the West Indies to northern South America. One-year-olds (and some two-year-olds) summer in the south as non-breeding sub-adults (NatureServe, 2006).

3.1.4.4.1.2 Piping plover (Threatened)

The piping plover (*Charadrius melodus*) is a small shorebird that occurs only in North America. This sandy colored bird has a black band between the eyes and a black ring around its neck. The legs are orange and the small beak is also orange with a black tip. They are seven inches long and because they tend to blend into their surroundings, therefore they are often heard before seen. (USFWS, 1994).

The piping plover has three main breeding areas: the Atlantic Coast: the northern Great Plains: and the Great Lakes Region. In 1986, the Atlantic Coast and northern Great Plains populations were listed as threatened and the Great Lakes population was listed as endangered (USFWS, 1994). Along the Atlantic Coast, nesting areas can be found from the Magdalen Islands in the Gulf of St. Lawrence to

Christmas Bird Count Data, Eastport Maine: Terns, Gulls and Coastal Waterbirds

Species	2000	2001	2002	2003	2004	2005
Bald Eagle (*Haliaeetus leucocephalus*)	15	11	9	25	103	8
Belted Kingfisher (*Ceryle alcyon*)		1	2			
Black Guillemot (*Cepphus grylle*)	23	13	10	14	23	6
Black-legged Kittiwake (*Rissa tridactyla*)	89	842	40	9000	2685	1512
Bonaparte's Gull (*Larus philadelphia*)	30	256	550	1295	1010	577
Common Merganser (*Mergus merganser*)	43	6	75	1	20	16
Common Murre (*Uria aalge*)				10		
Cormorant sp. (*Phalacrocorax*)					13	
Double-crested Cormorant (*Phalacrocorax auritus*)	3	4		18	2	2
Dovekie (*Alle alle*)	2			3		
Glaucous Gull (*Larus hyperboreus*)	4				1	
Great Black-backed Gull (*Larus marinus*)	2290	508	720	2220	860	388
Great Cormorant (*Phalacrocorax carbo*)	23	29	11	14	20	9
Herring Gull (*Larus argentatus*)	4518	1738	950	3871	2498	1177
Horned Grebe (*Podiceps auritus*)	10	9		10	14	2
Iceland Gull (*Larus glaucoides*)	202	2	9		5	7
Little Gull (*Larus minutus*)	3					
North Gannet (*Morus bassanus*)				2		
Purple Sandpiper (*Calidris maritime*)	73		12		9	

TABLE HMC-14: BIRD COUNT [QUODDY BAY LNG]

Christmas Bird Count Data, Eastport Maine:
Terns, Gulls and Coastal Waterbirds

Species	2000	2001	2002	2003	2004	2005
Razorbill *(Alca torda)*	9		3		2	3
Red-necked Grebe *(Podiceps grisegena)*	2	13	3	5	10	2
Red-throated Loon *(Gavia stellata)*	3		1		3	3
Ring-billed Gull *(Larus delawarensis)*	210	3	20	7	23	28
Small Gull sp. *(Lannae)*					30	
Thick-billed Murre *(Uria lomvia)*				18		

Source: CBC 2000-2006

TABLE HMC-15: SUMMARY OF BIRD COUNT
[QUODDY BAY LNG]

Christmas Bird Count Data Eastport, Maine
Waterfowl

Species	2000	2001	2002	2003	2004	2005
American Black Duck *(Anas rubripes)*	222	423	41	447	750	157
American Green-Winged Teal *(Anas crecca)*		1				
Barrow's Goldeneye *(Bucephala islandica)*		1		2		
Black Scoter *(Melanitta nigra)*				37	18	
Bufflehead *(Bucephala albeola)*	90	73	17	118	238	89
Canada Goose *(Branta Canadensis*	10	17		60	153	16
Common Eider *(Somateria mollissima)*	148	26	21	128	272	424
Common Goldeneye *(Bucephala clangula)*	9	30		40	54	8
Common Loon *(Gavia immer)*	5	13	4	23	22	7
Great Scaup *(Aythya marila)*				28	33	6
Harlequin Duck *(Histrionicus histrionicus)*	2					
Hooded Merganser *(Lophodytes cucullatus)*	39		19	1	10	16
King Eider *(Somateria spectabilis)*					3	
Long-tailed Duck *(Clangula hyemalis)*	10	83	4	145	92	106
Mallard *(Anas platyrhynchos)*	7	4	7	10	22	3
Northern Pintail *(Anas acuta)*	1					
Red-breasted Merganser *(Mergus serrator)*	50	2	18	109	82	41
Snow Goose (White form) *(Chen caerulescens)*						1
Surf Scoter *(Melanitta perspicillata)*		4		41	3	20
White-winged Scoter *(Melanitta fusca)*				30	70	49

ource: CBC 2000-2006

TABLE HMC-16: CHRISTMAS BIRD COUNT [II]
[QUODDY BAY LNG]

MDIFW Shorebird Observations Associated with the Pleasant Point Shorebird Use Areas 1980-1998 (MDIFW, 2006)

Common Name (*Scientific Name*)	Date	Carrying Place Cove SB0696	Carlow Island SB0699	Pleasant Point SB0700	Half Moon Cove SB0701	Gleason Cove SB0702	Lincoln Cove SB0773
Black-Bellied Plover	5/16/1980	15			1		
(Pluvialis squatarola)	5/28/1980	15	11				
	6/04/1980			5			
	7/30/1980	1					
	8/05/1980						
	8/13/1980	23		1	8		
	8/20/1980			1	4		
	8/27/1980	21					
	9/02/1980	24					
	9/17/1980				3		
	8/03/1991			1			
	8/04/1991	1					
	8/08/1991			1			
	8/09/1991	2		2			
	8/20/1991		1				
	8/25/1991	1	4		3		
	8/29/1991	3					
	8/30/1991	12			2		
	9/04/1991	2	1				
	9/20/1991		3	1		1	
	8/24/1994	20		1			
	7/30/1997						9
	8/20/1997	7					8
	8/28/1997		2				
	7/28/1998	9					
	8/11/1998						7
	8/17/1998	8					
	8/26/1998						9
	9/01/1998	7					
	9/11/1998						31
Semipalmated Plover	5/16/1980	2					
(Charadrius semipalmatus)	5/24/1980	1					
	5/28/1980		4				
	7/16/1980			4			
	7/30/1980					1	
	8/05/1980	2				3	
	8/13/1980	150			41	41	
	8/27/1980			66		32	
	7/30/1980			18			
	8/05/1980			11	20		
	8/13/1980			63			
	8/20/1980			31	22		
	9/02/1980	8		7			
	9/10/1980				4		
	9/17/1980	5			15		
	7/27/1991	7					
	8/03/1991	8	2			31	
	8/08/1991			42		39	
	8/09/1991	25					
	8/20/1991	1		1	9	48	
	8/25/1991	11			14		
	8/28/1991			60			
	8/29/1991	9			19		
	8/30/1991	2					
	9/01/1991			27		80	
	9/08/1991		5				
	9/09/1991	1					
	9/10/1991				11		

TABLE HMC-17: IFW SHOREBIRD OBSERVATIONS [QUODDY BAY LNG]

MDIFW Shorebird Observations Associated with the Pleasant Point Shorebird Use Areas 1980-1998 (MDIFW, 2006)							
Common Name (*Scientific Name*)	Date	Carrying Place Cove	Carlow Island	Pleasant Point	Half Moon Cove	Gleason Cove	Lincoln Cove
		SB0696	SB0699	SB0700	SB0701	SB0702	SB0773
	9/20/1991			9		3	
	8/13/1994			10			
	8/22/1994			1	10		
	8/24/1994	5		25			
	8/26/1994			10			
	7/30/1997		2	13			
	8/20/1997						10
	8/17/1998			1			
	8/26/1991						7
	9/01/1998	29					
	9/11/1998						6
Semipalmated Sandpiper *(Calidris pusilla)*	5/16/1980	34					
	5/24/1980	15				6	
	5/28/1980	142					
	6/04/1980	42					
	7/08/1980	15	66	556		26	
	7/16/1980	358		720		20	
	7/23/1980	1160		256	570	5	
	7/30/1980	2250		1450	350	40	
	8/05/1980	1660		1460	3400	40	
	8/13/1980	4214		2287	1931	183	
	8/20/1980			2174	556	10	
	8/27/1980	1135		1145		39	
	9/02/1980	134		36			
	9/10/1980	330		2		32	
	9/17/1980	76			68		
	7/14/1991	25					
	7/18/1991		6				
	7/19/1991				45		
	7/27/1991			4			
	8/03/1991					15	
	8/08/1991			13		4	
	8/09/1991	14					
	8/20/1991					153	
	8/25/1991				96		
	8/28/1991			46			
	8/29/1991				17		
	8/30/1991	3500			25	5	
	9/01/1991			69		288	
	9/08/1991	180					
	9/10/1991				41		
	9/20/1991			7			
	8/13/1994			4			
	8/22/1994				4		
	8/24/1994			125			
	8/26/1994			10			
	7/30/1997		35				2
	7/28/1998	1					
Least Sandpiper *(Calidris minutilla)*	5/16/1980	6				5	
	5/24/1980		6			1	
	7/08/1980	46				9	
	7/16/1980			46		39	
	7/30/1980	10					
	8/05/1980			10			
	8/13/1980					9	
	8/27/1980					3	
	9/02/1980	15					
	9/10/1980			15			
	9/24/1980	56					

TABLE HMC-18: IFW OBSERVATION [II] {QUODDY BAY LNG}

MDIFW Shorebird Observations Associated with the Pleasant Point Shorebird Use Areas 1980-1998 (MDIFW, 2006)

Common Name (*Scientific Name*)	Date	Carrying Place Cove	Carlow Island	Pleasant Point	Half Moon Cove	Gleason Cove	Lincoln Cove
		SB0696	SB0699	SB0700	SB0701	SB0702	SB0773
	7/14/1991	1					
	7/18/1991	2			3		
	7/19/1991	1			10		
	7/26/1991					2	
	7/27/1991				1		
	8/03/1991	2	2			3	
	8/08/1991			1			
	8/09/1991	8				6	
	8/20/1991	6	10	4	21	11	
	8/25/1991	10		3	7		
	8/27/1991		2	2			
	8/28/1991			3			
	8/29/1991	38			6		
	8/30/1991	11					
	9/01/1991			2		8	
	9/08/1991	1					
	9/09/1991	10					
	9/20/1991			2			
	7/18/1994	1					
	8/13/1994			4			
	8/24/1994			5			
Solitary Sandpiper (*Tringa solitaria*)	7/26/1991					1	
Spotted Sandpiper	7/26/1991					2	
(*Actitis macularia*)	7/30/1997					1	
White-rumped Sandpiper	8/25/1991	3					
(*Calidris fuscicollis*)	8/29/1991	2					
	8/30/1991	4					
	9/09/1991	1					
	8/24/1994			5			
Western Sandpiper (*Calidris mauri*)	8/26/1994			1			
Baird's Sandpiper (*Calidris baridii*)	8/09/1991	3					
Short-Billed Dowitcher	5/24/1980					1	
(*Limnodromus griseus*)	7/08/1980					48	
	7/16/1980					3	
	7/23/1980					3	
	7/30/1980			4			
	8/05/1980			1			
	8/08/1991		8				
	8/20/1991		4				
	8/25/1991				6		
	7/28/1998		3				
Ruddy Turnstone	8/05/1980	2				3	
(*Arenaria interpres*)	8/13/1980			2		1	
	8/20/1980			1			
	8/27/1980					13	
	9/02/1980			7			
	9/10/1980			5		2	
	8/24/1994	3					
	7/28/1998		1				

TABLE HMC-19: IFW OBSERVATIONS (III) [QUODDY BAY LNG]

MDIFW Shorebird Observations Associated with the Pleasant Point Shorebird Use Areas 1980-1998 (MDIFW, 2006)

Common Name (*Scientific Name*)	Date	Carrying Place Cove	Carlow Island	Pleasant Point	Half Moon Cove	Gleason Cove	Lincoln Cove
		SB0696	SB0699	SB0700	SB0701	SB0702	SB0773
Sanderling	8/27/1980			1			
(Calidris alba)	9/02/1980	3		8			
	9/10/1980			3		18	
	8/30/1991	1					
Peep Species	8/08/1983		3000				
	7/19/1991	49					
	7/27/1991	126		7	1		
	8/03/1991	150					
	8/04/1991	30					
	8/20/1991	700			1	22	
	8/25/1991	1200					
	8/29/1991	1450					
	9/01/1991	1500					
	9/04/1991	1800	80	30			
	9/09/1991	1500					
	9/10/1991	2500			5		
	9/18/1991	500					
	8/22/1994	250		250			
	7/30/1997	5	4			30	
	8/20/1997	26	75				100
	8/28/1997					4	
	7/28/1998	60	14				
	8/17/1998	50		8	3		
	8/26/1998						300
	9/01/1998	726		50			
	9/11/1998						122
	9/16/1998	1000					
Lesser Yellowlegs	7/08/1980					4	
(Tringa flavipes)	7/16/1980					10	
	7/23/1980					8	
	7/30/1980					12	
	8/13/1980					4	
	8/27/1980					1	
	7/19/1991					1	
	8/03/1991			1		1	
	8/08/1991		6	1		3	
	8/09/1991				1		
	8/20/1991			3			
	8/25/1991	1		2	2		
	8/27/1991			2			
	9/04/1991		1				
	9/08/1991			1			
	9/20/1991	1				1	
	7/18/1991	2					
	7/28/1991	6					
	7/12/1997						3
	7/19/1997						2
	7/30/1997		1				
	7/28/1998		6				
	8/11/1998						8
	8/17/1998	2		1	1		
Greater Yellowlegs	5/01/1980	1			8		
(Tringa melanoleuca)	5/08/1980	4				3	
	5/16/1980	2					
	5/24/1980					3	
	6/04/1980					4	
	7/08/1980					3	
	7/23/1980					3	

TABLE HMC-20: IFW OBSERVATIONS (IV) [QUODDY BAY LNG]

MDIFW Shorebird Observations Associated with the Pleasant Point Shorebird Use Areas 1980-1998 (MDIFW, 2006)

Common Name (*Scientific Name*)	Date	Carrying Place Cove	Carlow Island	Pleasant Point	Half Moon Cove	Gleason Cove	Lincoln Cove
		SB0696	SB0699	SB0700	SB0701	SB0702	SB0773
	8/05/1980	2					
	8/13/1980	150				15	
	8/20/1980					16	
	9/02/1980	8					
	9/17/1980	5			1		
	7/18/1991	3					
	8/03/1991	4					
	8/08/1991		1				
	8/20/1991			1			
	8/25/1991	3			4		
	8/29/1991				3		
	9/04/1991		4				
	9/10/1991	2					
	9/20/1991					5	
	7/18/1994	2					
	8/22/1994				1		
	7/12/1997						1
	7/28/1998		2				
	8/11/1998						4
Yellowlegs Species (*Tringa sp.*)	7/27/1991		5		2		
	8/03/1991	2					
	8/20/1991				1		
	8/25/1991				2		
	8/29/1991	1					
	9/04/1991				3		
	7/08/1997					1	
	7/30/1997		6			1	11
	8/20/1997		30				17
	8/28/1997		11				
	8/11/1998						7
	8/17/1998			2			
Killdeer (*Charadrius vociferous*)	7/18/1991				2		
	7/19/1991	1			2		
	7/26/1991					1	
	8/08/1991			1			
	8/09/1991					1	
	8/20/1991				1		
	8/13/1994			1			
	7/08/1997					2	
Red Knot (*Colidris canutus*)	8/27/1980	1					
Unidentified	8/20/1991	40	3				
	8/25/1991		20		15		
	9/02/1991	30					
	9/06/1991	1800					

TABLE HMC-21: IFW SHOREBIRD OBSERVATIONS (V) [QUODDY BAY LNG]

§ 5.6 (d)(3)(v)(A): Upland Habitats

(A) Upland habitat(s) in the project vicinity, including the project's transmission line corridor or right-of-way and a listing of plant and animal species that use the habitat(s); and

The water level of Half-Moon Cove will not exceed present conditions (i.e., vertical position / elevation) experienced during spring tides. The freshwater drainage area for Half-Moon Cove will not be impacted by the construction of a dam at the entrance to Half-Moon Cove and by the operation of the facility in accordance with the methodology outlined in this document.

Under the assumption that the project will utilize an existing transmission corridor to upgrade capabilities from the proposed dam to Pembroke, the impact of the upgrade is not anticipated to disturb this habitat beyond normal maintenance operations. The listing of upland habitats presented in the Quoddy Bay LNG application for the send-out pipleline from the storage tanks on the westerly side of Half-Moon Cove adequately describes the surrounding area.

§ 5.6 (d)(3)(v)(B): Temporal or Spatial Distribution

(B) Temporal or spatial distribution of species considered important because of their commercial, recreational, or cultural value.

The following information from the Quoddy Bay LNG proposal describes the appropriate features of commercial, recreational, and cultural resources of importance in Half-Moon Cove. Except for boat access for commercial fisherman, the impact on the resources is considered as not being significant in terms of the modified tidal regime within the basin.

3.1.1.1.3 Marine Invasive Species

Several species of marine invertebrates can be considered invasive, having been introduced over the past several centuries in association with vessel transits across the Atlantic ocean. The green crab, *Carcinus maenas*, was originally a European species that probably clung to the hull of wooden sailing vessels or whose larvae were introduced in ballast water. *Didemnum albidum* is an invasive tunicate first identified in Cobscook Bay over a hundred years ago. More recently, an unknown tunicate, possibly thought to be *Didemnum vexillim*, has been discovered in the Cobscook Bay area (Larry Harris, pers comm.). Invasive species can have varying degrees of affect on the local ecology, depending upon factors such as there competitiveness with native species, mode of reproduction, use of the habitat, hardiness, and other opportunistic characteristics.

It appears that there has been no systematic effort to evaluate the distribution of invasive tunicates in the Quoddy region. It is possible that the development of the more recent *Didemnum* in well-mixed areas like Cobscook Bay is limited by cold water temperatures. It may be that the temperatures do not allow sexual reproduction. In general species of *Didemnum* may recruit by budding or fragmentation of colonies.

In Half Moon Cove, clams are most abundant in areas of silt and sand, generally near to the causeway and exposed rocky ledges, and in the southern portion of the Cove. The northernmost portion of the Cove as well as the lower intertidal throughout the Cove have few clams in the predominately soft, silt and mud sediment (Nault, 2006). The Tribal Partnership Program Section 203 Studies at Half Moon Cove indicates that historically this area was productive prior to construction of the causeway connecting Pleasant Point and Carlow Island, which resulted in increased silt deposition. According to Steve Crawford, Environmental Planner for the Passamaquoddy Tribe (Crawford, 2006a), this area has not been productive in recent memory, as sediments are too soft and silty to support a clam population. A shellfish survey was conducted in July 2005 by the U.S. Army Corps of Engineers (2006), and results are reported in USACE, 2005. Sample plots were generally concentrated along the western side of the causeway north and south of Split Rock. Additional stations were located in the lower intertidal near the middle of the Cove, and two on the east side of the causeway. Plots varied in size, from 1 ft^2 to 10 ft^2. Eight of the thirteen stations yielded clams ranging in size from 0.50 inches (1.27 cm) to 3.38 inches (8.52 cm); average size was 1.20 inches (3.05 cm); average number of clams per square foot over all plots was 1.6, ranging from 0 to 22. The Cove has had successful sets for the past several years but few grow to the 2-inch legal size; high numbers of sub-legal sized clams are present (Crawford, 2006a; Nault, 2006). Softshell clam are also harvested on the eastern side of the causeway in the non-ledge areas. To the north, Gleason Cove has also been an area of regular harvesting. However, no estimates on landings from this cove were available.

Quoddy Bay collected shellfish data were collected at 145 stations in the vicinity of the proposed pipeline route through Half Moon Cove between August 21-23, 2006. Three intertidal transects were established on the east and west sides of Half Moon Cove (Appendix 3-E). Softshell clams (*Mya arenaria*) are the dominant shellfish species within the project area in Half Moon Cove. The majority of clams collected were less than 30 mm and the largest individual measured 82 mm. Of the total collected, 179 clams were classified as juveniles (≥24mm), 116 were sub-legal adults (25-50 mm), and 69 were legally harvestable adults (≥51mm). Densities ranged from 0 to 22 clams per square foot sample with a mean of 2.5. By comparison, the largest individual collected during the USACE survey was 85 mm and densities also ranged from 0 to 22 clams per square foot sample, with a slightly lower mean of 1.6 (USACE 2005a). The distribution of *M. arenaria* throughout the intertidal reflected the availability of suitable habitat. Densities were typically highest between 150 and 550 feet into the intertidal, following patterns of variation in sediment composition. Sand content in the sediments was highest in the upper intertidal, with increasing amounts of soft silt and mud towards the lower intertidal.

Scallops are harvested by boats equipped with 5 ½ foot drags, and by scuba divers. The scallop season is from December 1 to April 15. Scallops are harvested in the Western Passage, in Cobscook Bay, and just inside Half Moon Cove in the Bar Harbor area of the old toll bridge (Mitchell, 2006). Draggers also fish around Nipps, Spectacle and Goose Islands, which are adjacent to and south of Half Moon Cove (Matthews, 2006). The MDMR scallop stock assessment study conducted in 2001–2004 collected scallops in five areas within Cobscook Bay. The density of harvestable-size scallops was lowest (0.019 per meter^2) in the area sampled closest to Half Moon Cove, labeled as "Other" (west of Nipps Island southward to Goose Island), compared with the highest density (0.077 per m^2) found in South Bay. South Bay lies in the southern half of Central Bay, which is the largest portion of Cobscook Bay. Tidal circulation and exchange studies conducted by Brooks (2004) revealed the presence of paired back-eddies in the Inner Bay, which result in lower flushing times of up to a week or longer compared with flushing rates in the Outer Bay of one to two days. This could contribute to higher recruitment and retention of larval scallops in this area.

The MDMR assessment data reports a total of 28,246 kg (62,272 lbs) of harvestable biomass in all six of the areas surveyed in Cobscook Bay; the area closest to the Half Moon Cove yielded 1,340 kg (2,954 lbs); South Bay had the highest yield (40,821 lbs,18,516 kg) (Schick and Feindel, 2005).

Scallop densities in Half Moon Cove are thought to be confined to the old toll road crossing in areas not exposed during the low tides. Eelgrass beds are mapped on either side of this channel and may serve as a nursery for scallops in the area. According to Russell Wright (2006), there may be 2 to 3 draggers in the area, in the Western Passage and around the Half Moon Cove area on most days during the season. Harbor Pilot Captain Bob Peacock (2006) also has observed draggers in the Western Passage zone, and one to two occasionally in Half Moon Cove. Many fisherpersons hold multiple licenses, fishing various species with the changing seasons and markets. In the towns surrounding Cobscook Bay, 99 scalloping licenses were issued in 2005 by the MDMR, including 82 dragger, 6 diver, and 11 non-commercial licenses. The Town of Perry issued 23, Eastport issued 11, and the Passamaquoddy Tribal Center issued 10 licenses. The Tribal Center licenses were under a combination category that allows for the harvesting of several species, including scallops. Scallop licenses are issued under state jurisdiction and allow for harvesting anywhere within state waters; boats fishing the Cobscook Bay or Western Passage are not necessarily local. A report prepared for the Cobscook Bay Resource Center estimates 22 to 40 boats from the Cobscook Bay area towns actively fish for scallops in Cobscook Bay (Athearn, 2005).

According to MDMR state-wide landings data, 178,400 lbs of scallops were harvested in 2004 (see Table 3.1.1-9). Fishery market studies by Athearn (2005) estimates of 155,000 lbs of scallops were landed from Cobscook Bay alone at a gross ex-vessel value of $1 million.

shipping to Far East markets. Canadians in Labrador and Newfoundland are beginning to consider harvesting this species with divers or by dragging (Hamel and Mercier, 1999).

In Maine, fishermen are now required to have a sea cucumber drag license, granted only to those who have harvested at least 100,000 lbs. of sea cucumbers in 2002, 2003, or 2004. In addition, they must use a drag no larger than 5-foot 6-inches, and fish only during the daylight hours. The season is closed from July 1-September 30These new regulations were designed to reduce fishing pressure while evaluating management options. Divers could in the future be used to harvest sea cucumbers, as is done in other states.

In Passamaquoddy Bay, there are no licenses for sea cucumber dragging. There is anecdotal information about harvest activities. There are two or three scallop draggers in the area that may harvest cucumbers in the off-season (Wright 2006). The Passamaquoddy Tribe Environmental Department reports that the sea cucumber is currently not commercially-collected in Half Moon Cove (Crawford, 2006a), but are harvested from the Western Passage area.

3.1.1.4.19 Algae

Algae harvesting in Maine includes a variety of species including bladderwrack (*Fucus* spp.) rockweed (*Ascophyllum nodosum*), nori or laver (*Porphyra),* kelps *Laminaria* spp., dulse (*Palmaria palmaria),* Alaria (*Alaria esculenta)* and Irish moss (*Chondrus crispus)*, used to make carrageenan. Harvest is mainly by hand; there is some experimentation with mariculture of nori. Mechanical harvesting occurs in Canada, with one mechanical harvester in operation in the State of Maine.

Rockweed is the most commonly harvested species. Harvest is by hand, either on foot or in a boat, using a rake. Maine harvest regulations specify that the lowest lateral branches must remain attached, with at least 16 inches of holdfast. Rockweed is an important species in the intertidal zone, providing habitat, food, and cover for a variety of intertidal organisms. It can grow up to 8 feet long and live 12-15 years. It is harvested for use as a mulch and fertilizer as well as cattle feed. A more detailed description of macroalgal species is provided in Section 3.1.2.1.

The sum total of seaweed harvest in 2004 was 3.5 million pounds, worth approximately $202, 482. Harvest over time has been highly variable, relatively low through the 1990s and experiencing a resurgence in 2001-2002, before dropping slightly in 2003-2004.

The state issued 73 licenses in 2005, of which six are in Cobscook Bay. Of these, one was issued in Eastport. There appears to be little seaweed harvesting currently. Nori was formerly harvested by one person, but it was not profitable (Mitchell, 2006).

3.1.1.4.20 Commercially Important Species Observed During Benthic and Sediment Profile Image Surveys

Quoddy Bay conducted macroinvertebrate benthic surveys during July 2006 (Appendix 3-B). Several taxa of economic importance to commercial or recreational fisheries were collected during the July 2006 benthic survey. Rockweeds, including *Ascophyllum nodosum* and *Fucus vesiculosus*, were the dominant algal taxa in the rocky intertidal, and Irish moss (*Chondrus crispus*) was found at one site in Western Passage. Blue mussels (*Mytilus edulis*), common periwinkles (*Littorina littorea*), softshell clams (*Mya arenaria*) (Appendix 3-E) and sand worms (*Neanthes virens*), were all collected during the survey. Among the economically important invertebrate taxa, only blue mussels were found in abundance.

In addition, benthic habitats were characterized by a Sediment Profile Imaging (SPI) survey, also conducted in July 2006 (Appendix 3-C). A number of commercially important species were observed in SPI and surface video. These include *Cancer* crabs, sea scallops, blue mussels, sea cucumbers, green urchins, and sculpin. The blue mussel was the only commercial species to be found in both Half Moon Cove and Western Passage images. Burrow openings at the sediment surface were observed at stations in both project areas. These openings may have been siphon holes of bivalves or worm tubes, but the photography did not allow for identifying the organism(s) that made the openings. At Western Passage stations, green urchins were overall the most abundant and widely distributed of the commercial species with high densities at most stations. The other commercial species, Cancer crabs and sea scallops, were abundant at one or two stations in Western Passage. Sea cucumbers were widely distributed but occurred in lower densities.