Discovery Report

Southern Portion of Lower Penobscot Watershed, 01020005
Penobscot County
Maine
Report Number 01

06/28/2016

FEMA

Project Area Community List

Community Name
Bangor
Bradley
Brewer
Carmel
Clifton
Corinth
Dixmont
Eddington
Etna
Exeter
Glenburn
Hampden
Hermon
Holden
Kenduskeag
Levant
Milford
Newburgh
Old Town
Orono
Orrington
Penobscot Indian Nation
Plymouth
Stetson
Veazie

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I. General Information

This Discovery project work was managed by the Maine Cooperating Technical Partner, the Maine Department of Agriculture Conservation and Forestry. The watershed stakeholder coordination, data analysis, Discovery meeting preparation and follow-up, and coordination of scope refinement were performed by the Maine Floodplain Management Program (MEFMP) staff. AECOM Technical Services Inc. performed the First Order Approximation (A.K.A. "Automated Engineering") zone A modeling work.

The USGS hydrologic unit code (HUC) for the Lower Penobscot Watershed is 01020005. The project area is the southern portion of the Lower Penobscot HUC8 comprised of the following 25 communities: Bangor, Bradley, Brewer, Carmel, Clifton, Corinth, Dixmont, Eddington, Etna, Exeter, Glenburn, Hampden, Hermon, Holden, Kenduskeag, Levant, Milford, Newburgh, Old Town, Orono, Orrington, Penobscot Indian Nation, Plymouth, Stetson, and Veazie.

Major streams in the area include the Black, Blackman, Great Works, Kenduskeag, Mohawk, Pushaw, and Souadabscook; all tributaries of the Penobscot River. Within the project area, from approximately Veazie and Eddington downstream, the river is tidally influenced to a minimal degree. Information on the extent of tidal influence and its impact on flooding concerns can be found in the 2016 Multi-Jurisdictional Hazard Mitigation Plan for Penobscot County, ME.

The Penobscot River within the project area and portions of several of the streams are considered critical habitat for Atlantic Salmon Gulf of Maine Distinct Population Segment. The Penobscot River below the Milford Dam is considered critical habitat for Endangered Shortnose sturgeon.

An overview map of the project area is provided in Figure 1.

Figure 1. Project Overview Map

II. Watershed Stakeholder Coordination

The interactive online questionnaire titled "Lower Penobscot Watershed Risk MAP Discovery Questionnaire for FEMA Flood Insurance Rate Maps" was developed by MEFMP in order to assess the mapping needs of the community and assess the community resources available for improving the floodplain maps, and the community awareness of and ability to mitigate flood hazards. A PDF copy of the questionnaire is attached as Appendix A. A live link to the questionnaire was included in the email notification to stakeholders, and the web-address was included in the mailed letter notification.

Mailed notification of the meeting date and times, including a request to RSVP and a request to fill out the questionnaire went to the primary elected official, code enforcement officer, town administrator, planning board chair, and EMA director (or fire chief if there was no EMA director) of each project community on February 10, 2016. In addition, emailed notification went to, at a minimum, the code enforcement officer and town administrator of each project community on February 10, 2016. Copies of the notification letters are included as Appendix B. Follow-up phone calls were placed to each community that did not initially respond to the questionnaire between late February and early May. Due in large part to the follow-up phone calls, between the period of February 22nd and March 25th, 21 responses to the questionnaire were recorded. Most of the responses were from community officials, such as code enforcement officers and town managers in the project area.

Other stakeholders that were invited to the meeting by the Maine Floodplain Management Program staff via email include:

First	Last	Organization /Title
Joann	Mooney	MEMA/State Hazard Mitigation Officer
Michelle	Tanguay	Regional EMA Director
Jon	Farley	Regional Planning Commission
Dan	Baumert	USDA - NRCS
Penobscot Co.	Office	Penobscot Soil and Water Conservation Service

On April 21, 2016 an additional mailed notification went out to Code Enforcement Officers, Community Administrators, Chief Elected Officials and Emergency Management Directors on behalf of FEMA, inviting stakeholders to attend the Discovery Meeting. Copies of the letters are included as Appendix C.

A complete list of community officials contacted is attached as Appendix D. Responses to the questionnaire, and including stakeholder responses to information requests at the Discovery Meetings are included as Appendix E. The RSVP list and sign-in sheets for both meetings are included as Appendix F.

III. Data Analysis

A list of the data collected and the source of the data is shown in Table 1. In addition, Data Analysis is divided between two sections: one section listing the data that can be used for Risk MAP products (regulatory and non-regulatory) and one section listing other data and information that helped the project team to form a more holistic understanding of this watershed.

Table 1: Data Collection for Lower Penobscot Watershed Discovery

Data Layer	Notes & Source
FIRM Panel Index	
Topographic Data Footprint	Extent of 2014 LiDAR Mission project footprint shapefile: Maine Office of GIS
Topographic Data	GISVIEW.MEGIS.Contours_2ft GISRASTER.MEGIS.MEDEM2_SHADE
Aerial Photography	http://mapserver.maine.gov/wms/mapserv.exe?map=c:/wms/orthos.map&
FEMA Flood Zones	FEMA Q3 Flood Data (1990)
LOMC's	FEMA Map Service Center NFHL_23_20150716
Repetitive Loss	FEMA CIS Community Reports
Severe Repetitive Loss	FEMA Media Library https://www.fema.gov/media-library/assets/documents/103337
CNMS	Coordinated Needs Management Strategy (CNMS) database from FEMA Region 1 Includes stream lines (S_Studies_Ln) indicating validation status and flood zone type.
NHD Stream Lines	Maine Office of GIS shapefile GISVIEW.MEGIS.NHDFlowline
NHD Water Bodies	Maine Office of GIS shapefile GISVIEW.MEGIS.NHDWaterbody
Roads	Maine Office of GIS shapefile GISVIEW.MEGIS.NG_ROADS Maine Office of GIS shapefile GISVIEW.MEDOT.medotpubrds
Community Boundaries	Maine Office of GIS shapefile GISVIEW.MEGIS.Metwp24P
County Boundaries	Maine Office of GIS shapefile GISVIEW.MEGIS.Cnty24P
Watershed Boundaries	Maine Office of GIS shapefile GISVIEW.MEGIS.WBDHU8
Conserved Lands	Maine Office of GIS shapefile GISVIEW.MECONSLANDS.Conserved_Lands
Tribal Lands/Reservations	Maine Office of GIS shapefile GISVIEW.MEGIS.Metwp24P Maine Office of GIS table GISVIEW.MEGIS.GEOCODES Field "Status" = R for Reservation
Dams	Maine Office of GIS shapefile GISVIEW.MEGIS.Impounds
Stream Gages	USGS text locations
Tidal Gages	NOAA

Wind Gages	NOAA
Coastal Barrier Resources (CBR)	USFW shapefile download http://www.fws.gov/ecological-services/habitat-conservation/cbra/Maps/index.html
Coastal Bluff Hazards	Maine Office of GIS shapefile GISVIEW.MEMGS.COASTAL_BLUFF_HAZARDS
Parcels	Maine Office of GIS shapefile GISVIEW.MEGIS.Parcels
Community Requests	CNMS S_req submitted to FEMA CNMS database coordinator for upload to https://msc.fema.gov/cnms/
Areas of Mitigation Interest	Penobscot County Multi-Jurisdictional Hazard Mitigation Plan http://penobscotema.squarespace.com/hazard-mitigation-plan/

i. Data that can be used for Flood Risk Products

As shown on the Final Discovery Map in Appendix H of this report, LiDAR (Airborne Light Detection and Ranging) was collected within the study area for the Maine Office of GIS in 2015. The data meets the specifications of the National Enhanced Elevation Assessment Quality Level 2, and Quality Level 1.

ii. Other Data and Information

a. Multi-Jurisdictional Hazard Mitigation Plan Status

The current Multi-Jurisdictional Hazard Mitigation Plan for Penobscot county, which covers all the communities in the area of interest, received Formal Approval on February 16th, 2012. Hazard Mitigation Plans expire 5 years after their Formal Approval date. The plan has been updated and received Approval Pending Adoption (APA) from FEMA on April 22nd. The next step in the update process will be for each community to adopt the plan through a resolution and then for the plan to be submitted for Formal Approval, a process for which the State Hazard Mitigation Officer, Joann Mooney, will be the contact.

The current plan, with pending updates shown, can be viewed on the Penobscot County Emergency Management Agency's website at:
http://penobscotema.squarespace.com/hazard-mitigation-plan/

In addition to the information that can be found in the plan, EMA Director Michelle Tanguay provided the following insight into the flood risk concerns in the project area:

> The major factors for us are the winter ice and spring runoff combined with rain fall and warm temps. If all these factors are at

a high, then odds are we have spring flooding but if low, we're good.

Penobscot (PT) PT County has only been able to hit the level of damages for 1 Disaster Declaration since the ice storm of 98 and that was the May Day Floods in 2008. Aroostook County was hit pretty bad however, there were enough communities along the Penobscot River in PT County that incurred damages that we were able to meet our threshold and request assistance. There is only 1 community on your list below that was affected by the May Day flood and that would be Old Town. More communities north of Old Town were affected, basically follow the river up. (Milford, Costigan, Passadumkeag, Mattawamkeag and Grindstone are the ones that have continues spring flooding) In my mind, each community has a "problem area" that as an Emergency Manager, I go to that if flooding is going to happen, will be flooded.

Let me just do an overview on each left on your list and then you can always ask me additional if needed.

Bangor- Penobscot River in downtown is always an area of concern for spring flooding or heavy rains. Spring flooding is contingent on ice. The heavy rains put a strain on our storm drain system and usually flood the lower level of the parking garage. The parking lot behind Seadog, under the Joshua chamberlain bridge gets some water in it during high tides with heavy rains too.
Old Town & Orono- Pretty much the same as Bangor, dependent on ice/spring flooding. If there is a lot of ice, heavy rain and high tide, we have areas we monitor along river. These include lower level parking lots by the University of Maine, Orono Steam Plant and Sears Island in Orono.
Veazie- Not sure about Veazie- they normally don't have issues.
Dixmont- The only issue I remember them having is a road washed out because of heavy rains. They are not near the river or any lakes so not sure..
Glenburn- Pushaw Lake with heavy rains creates several areas of flooding in the spring time. It's the area along the Lake and the Pushaw Road.
Kenduskeag- Not sure about this one either, they don't have any large lakes or issues in the springtime. Local road washouts and small streams maybe.
Eddington- Like Bangor, Orono and Old Town, but the only area would be Chemo Pond and the Boat Launch along the River.
Orrington- Beaver Dams on Swetts Pond, otherwise no river flooding.

b. USGS Stream Station locations within the project:

Tidal Stream Site
USGS 01037050 Penobscot River at Bangor, Maine
Latitude 44°47'47", Longitude 68°46'04" NAD83

Stream Site
USGS 01036390 Penobscot River at Eddington, Maine
Latitude 44°49'36", Longitude 68°41'48" NAD83

Stream Site
USGS 01037000 Kenduskeag Stream near Bangor, Maine
Latitude 44°51'40", Longitude 68°49'54" NAD83

c. CNMS and NFIP Mapping Study Needs

Region I CNMS data indicates that the majority of the riverine flooding sources within the project area have validation status of "Unverified – To Be Studied". The reasons that many reaches remain unverified vary, but are largely due to significant changes to terrain, hydraulic structures, or surface types; accepted modeling methods; and data updates. Many of the communities indicated during the Discovery Process that the existing flood maps are generally inaccurate particularly with regard to existing Zone A's. Current CNMS Stream Inventory mileage is summarized in Table 2.

Table 2: CNMS Miles for Lower Penobscot Discovery Communities

Validation Status	Status Type	Zone A	Detailed	Unmapped
Unknown	To Be Assessed	0	0	-
Unverified	To Be Studied	348.5	18.0	-
Valid	NVUE Compliant	0	121.7	-
Total CNMS Inventory		348.5	139.7	-
Total Unmapped*				117.26

d. Socio-economic Analysis

According to the United States Census Bureau's most recent census data (2010), the combined population of the communities in the project area is approximately 113,000. The most populated City is Bangor with approximately 31,000 residents. The City of Orono has approximately 10,500; the City of Brewer has approximately 9,200 and the City of Old Town has approximately 8,500

residents. The remaining communities have between 700 and 7000 residents. In 2014 19% of the population were 18 years of age or under, 64% were between the ages of 18 to 65 and 17% were 65 years of age or older.

In 2014 95% of the population of Penobscot County identified as White alone; 1%, 1% identified as American Indian and Alaska Native alone; 1% identified as Black or African American alone, 1% identified as Hispanic or Latino and 1% identified as Asian alone.

The median value of homes in Penobscot County is $137,700. 91% of the population are high school graduates and 24% have bachelor's degrees. The median household income in 2014 dollars is $44,543. 18% of the population is in poverty.

e. Community NFIP Data

Letters of Map Change (LOMCs)

The presence and number of LOMCs in a community can be an indication of increasing development in a community and/or problematic flood hazard boundaries. As of December 2015, Penobscot County had 377 Letters of Map Amendment and 7 Letters of Map Revision. The county has a population of 153, 364 in the most recent census. The number of Letters of Map Change per person is approximately 2 per 100.

Community Rating System (CRS)

Currently, the only Community Rating System (CRS) community in the project area is the City of Old Town

Repetitive Loss

There are eleven repetitive loss properties in the town of Milford, within the project area.

Insurance Policies and Coverage

There are 247 total policies in the project area and a total of $44,188,300 worth of insurance coverage.

Table 3: Project Area NFIP Data by Community

Community	Total Area Population	LOMCS	CRS	Rep Loss	Insurance Policies	Insurance Coverage
Bangor	31,000	10			60	$ 12,589,200
Bradley	1,400	2			4	$ 201,200
Brewer	9,200	9			8	$ 1,442,400
Carmel	1,301	0				

Clitfon	743	7			1	$ 105,000
Corinth	2,400	1			2	$ 425,500
Dixmont	1,008	6				
Eddington	2,200	1			2	$ 290,000
Etna	1,012	0				
Exeter	1,092	2				
Glenburn	5,000	38			32	$ 5,506,700
Hampden	6,757	11			19	$ 4,765,400
Hermon	4,540	29			6	$ 963,900
Holden	2,952	6			3	$ 552,900
Kenduskeag	1,265	1			7	$ 1,233,700
Levant	2,300	16			3	$ 358,200
Milford	3,000	9		11	24	$ 3,116,200
Newburgh	1,412	2				
Old Town	8,500	58	Yes		39	$ 5,383,800
Orono	10,500	24			25	$ 5,402,300
Orrington	3,526	53			7	$ 1,368,400
Plymouth	1,175	10			2	$ 243,300
Stetson	1,150	9			2	$ 144,200
Veazie	2,011	1			1	$ 96,000

Community Participation

As shown in Table 4, Carmel is the only community in the project area that does not currently participate in the NFIP. Most of the communities became program participants in the 1970s.

Table 4: Community Participation

Community	Program	Status	Emergency	Regular Entry
BANGOR, CITY OF	Regular	PARTICIPATING	04/03/1975	06/15/1978
BRADLEY, TOWN OF	Regular	PARTICIPATING	11/25/1974	05/01/1978
BREWER, CITY OF	Regular	PARTICIPATING	02/21/1975	06/01/1978
CARMEL, TOWN OF		NOT PARTICIPATING		
CLIFTON, TOWN OF	Regular	PARTICIPATING	03/30/1990	05/02/1994
CORINTH, TOWN OF	Regular	PARTICIPATING	03/30/1990	07/01/1991
DIXMONT,TOWN OF	Regular	PARTICIPATING	04/19/1976	02/04/1987
EDDINGTON, TOWN OF	Regular	PARTICIPATING	02/09/1976	07/03/1978
ETNA, TOWN OF	Regular	PARTICIPATING	05/19/1976	04/09/1985
EXETER, TOWN OF	Emergency	PARTICIPATING	03/19/2014	
GLENBURN, TOWN OF	Regular	PARTICIPATING	07/15/1975	08/05/1991
HAMPDEN, TOWN OF	Regular	PARTICIPATING	11/24/1975	09/04/1987
HERMON, TOWN OF	Regular	PARTICIPATING	06/11/1975	09/27/1985
HOLDEN, TOWN OF	Regular	PARTICIPATING	07/23/1975	11/07/1978
KENDUSKEAG, TOWN OF	Regular	PARTICIPATING	03/15/1976	09/18/1985
LEVANT, TOWN OF	Regular	PARTICIPATING	03/13/1990	07/01/1991
MILFORD, TOWN OF	Regular	PARTICIPATING	05/30/1975	04/17/1978
NEWBURGH, TOWN OF	Regular	PARTICIPATING	09/16/1975	12/04/1985
OLD TOWN, CITY OF	Regular	PARTICIPATING	06/25/1974	04/17/1978
ORONO, TOWN OF	Regular	PARTICIPATING	04/03/1975	07/03/1978
ORRINGTON, TOWN OF	Regular	PARTICIPATING	09/20/1994	01/07/2003
PLYMOUTH, TOWN OF	Regular	PARTICIPATING	03/30/1990	07/01/1991
STETSON, TOWN OF	Regular	PARTICIPATING	08/18/1975	09/18/1985
VEAZIE, TOWN OF	Regular	PARTICIPATING	04/19/1979	04/19/1979

Community Map Status

As shown in Table 5 below, community map dates range from the 1970s to 2002, in the case of Bangor and Orrington. Many of the maps have all zone A, C and X with no elevations determined. The Town of Etna had a Flood Hazard Boundary Map dated 1/1/1975, but it was rescinded. Etna currently does not have any mapped SFHA. This puts the community at increased risk, as there are parts of Etna and Plymouth Pond within Etna, as well as Tracy Brook and several smaller streams. Some of the streams intersect major roadways, including I-95.
All of the communities in the project area are at increased risk due to their outdated or nonexistent FIRMs.

Table 5: Community Map Status

Community	Current Map	FIRM
BANGOR, CITY OF	03/04/2002	REVISED
BRADLEY, TOWN OF	05/01/1978	ORIGINAL
BREWER, CITY OF	06/01/1978	ORIGINAL
CARMEL, TOWN OF	02/28/1975	NEVER MAPPED
CLIFTON, TOWN OF	05/02/1994	ORIGINAL
CORINTH, TOWN OF	07/01/1991	ALL ZONE A, C AND X - ORIGINAL FIRM BY LETTER
DIXMONT,TOWN OF	02/04/1987	ALL ZONE A, C AND X - NO ELEVATION DETERMINED
EDDINGTON, TOWN OF	07/03/1978	ORIGINAL
ETNA, TOWN OF		ALL ZONE C AND X - NO PUBLISHED FIRM
EXETER, TOWN OF	02/21/1975	NEVER MAPPED
GLENBURN, TOWN OF	08/16/1993	REVISED
HAMPDEN, TOWN OF	09/04/1987	ORIGINAL
HERMON, TOWN OF	09/27/1985	ALL ZONE A, C AND X - NO ELEVATION DETERMINED
HOLDEN, TOWN OF	07/03/1995	REVISED
KENDUSKEAG, TOWN OF	09/18/1985	ALL ZONE A, C AND X - NO ELEVATION DETERMINED
LEVANT, TOWN OF	07/01/1991	ALL ZONE A, C AND X - ORIGINAL FIRM BY LETTER
MILFORD, TOWN OF	04/17/1978	ORIGINAL
NEWBURGH, TOWN OF	12/04/1985	ALL ZONE A, C AND X - NO ELEVATION DETERMINED
OLD TOWN, CITY OF	04/17/1978	ORIGINAL
ORONO, TOWN OF	07/03/1978	ORIGINAL
ORRINGTON, TOWN OF	07/17/2002	ORIGINAL
PLYMOUTH, TOWN OF	07/01/1991	ALL ZONE A, C AND X - ORIGINAL FIRM BY LETTER
STETSON, TOWN OF	08/19/1991	REVISED
VEAZIE, TOWN OF	05/01/1978	ORIGINAL

Dams and Levees

A significant portion of the below information on dams in the project area was derived from the Penobscot County Multi-Jurisdictional Hazard Mitigation Plan.

Dams

The following is a listing of high and significant hazard dams for Penobscot County, with their location and their hazard potential. Due to the fact that the dams not located in the project area are upstream of the project area, and the down-stream hazard potential is listed as high or significant; the entire table is included. The initials for Hazard Potential found in the table are representative of:

L=Low, failure would probably only cause damage to the owners property
H=High, failure would cause loss of life
S=Significant, failure would cause significant loss of property

Table 6. High and Significant Hazard Dams

Dam Name	Town	Down-stream Hazard Potential
Wassookeag Lake	Dexter	**H**
East Millinocket Hydro	East Millinocket	**H**
Weldon	Mattawamkeag	**H**
North Twin	T3 Indian Purchase	**H**
North Twin - Dike 6	T3 Indian Purchase	**H**
Stone	Millinocket	**H**
Stone - Dike 8	Millinocket	**H**
Dolby	East Millinocket	**H**
Grand Lake	T06 R08 WELS	**S**
Long Pond	Lincoln	**S**
Malletts Mill	Lee	**S**
Swetts Pond	Orrington	**S**
North Twin - Dike 1	T3 Indian Purchase	**S**
North Twin - Dike 2	T3 Indian Purchase	**S**
North Twin - Dike 3	T3 Indian Purchase	**S**
North Twin - Dike 4	T3 Indian Purchase	**S**
North Twin - Dike 5	T3 Indian Purchase	**S**

Source: State of Maine, (MEMA) Dam Safety

In 2013, the Maine State Dam Safety Law was changed to reflect a different frequency of dam inspections. High and Significant rated dams must be inspected every six years. All dams must be inspected every twelve years to verify their hazard rating. The Federal Energy Regulatory Commission (FERC) regulates 34 H hazard and 12 S hazard dams in Maine and has 5 engineers to do the inspections. The State regulates 26 H hazard and 79 S hazard dams and employs one engineer.

Although located in Piscataquis County, Ripagenous Dam, if breached, is a considerable flooding hazard for Penobscot County. The impoundment of the dam forms Chesuncook Lake, which is Maine's third largest body of fresh water, and is considered the beginning of the West Branch of the Penobscot River. Three distinct sections of the lake are connected: the main stem is known as Chesuncook Lake; the lower body as Caribou Lake; and a third appendage as Ripagenous Lake. The total impoundment is 26,200 acres, with a maximum depth of 150 feet.

Levees

There is one levee located on Penobscot Indian Island in Old Town. It is rated unacceptable by the US Army Corps of Engineers due to lack of inspections and encroachments.

IV. Discovery Meetings

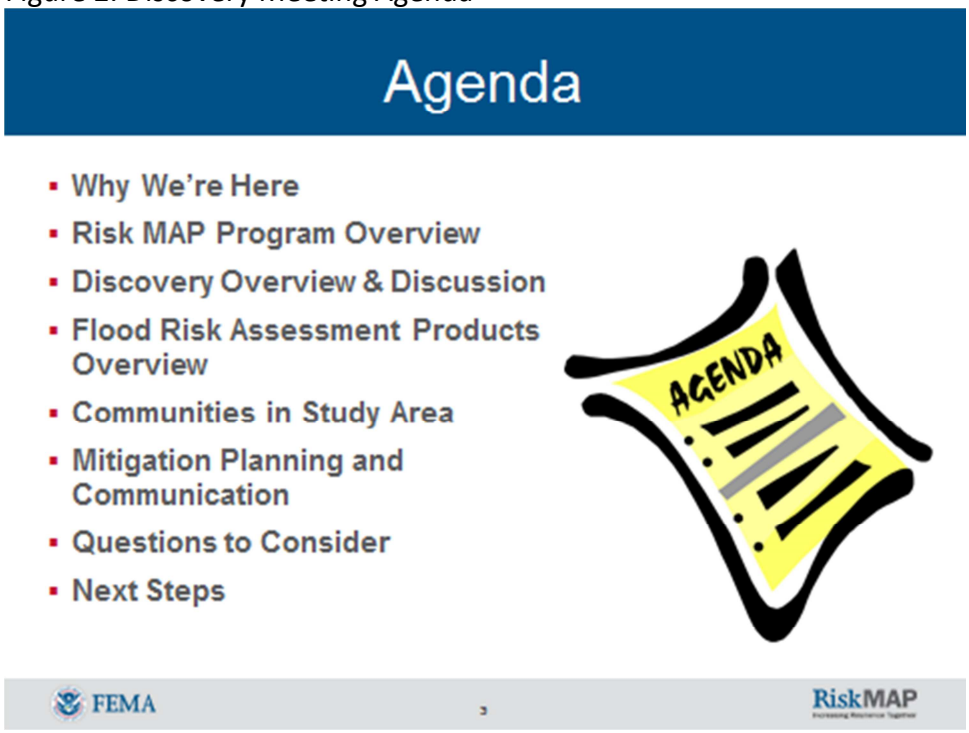
The Discovery Meetings were held on April 26th, 2016 at the Hampden Public Safety Building in Hampden, ME. There was a morning meeting from 9AM – 11:30 AM and another from 1PM – 3:30 PM.

Representatives were present from FEMA, Maine Floodplain Management Program, Penobscot County Emergency Management Agency, USDA-NRCS, the Greater Pushaw Lake Association and the communities of Hampden, Brewer, Hermon, Bangor, Glenburn, Orono, Bradley, Eddington, Corinth, Orrington, Dixmont, Plymouth, Etna and Veazie.

Comments from the meeting on floodplain mapping requirements were integrated into the CNMS S_requests data previously generated by the questionnaire responses.

Figure 2 below is the meeting agenda. See Appendix G for the full presentation, and Appendix F for meeting RSVP list and scans of the meeting sign-in sheets.

Figure 2. Discovery Meeting Agenda



Appendix and Tables

Appendix A – Questionnaire

Appendix B – Stakeholder Engagement

Appendix C – FEMA Notification

Appendix D – Watershed Stakeholder Contacts

Appendix E – Stakeholder Responses

Appendix F – Meeting RSVP & Sign-in Sheets

Appendix G – Discovery Meeting Presentation

Appendix H – Discovery Map

Appendix I – Automated Engineering

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