

**Comprehensive Project Plan for the  
National Wetland Inventory Update of Minnesota**

**July 27, 2011**

**Minnesota Department of Natural Resources  
Division of Ecological Resources  
500 Lafayette Road North  
St. Paul, MN 55155**



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This document was prepared by the DNR with input and guidance from an interagency technical advisory committee. The agencies represented on the technical advisory committee include:

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Nancy Read	Metropolitan Mosquito Control District
Mark Gernes	Minnesota Pollution Control Agency
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Rob Sip	Minnesota Department of Agriculture
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## **1. Document Scope and Relationship to Other Documents**

This document serves as a comprehensive project plan for the statewide update of the National Wetlands Inventory (NWI) for Minnesota. Additional details are covered by other documents. These documents are incorporated by reference as part of the overall plan. These include:

- Requirements for the NWI Update of Minnesota,
- Quality Assurance Plan for the NWI Update of Minnesota
- Data Plan for the NWI Update of Minnesota

## **2. Background**

### **2.1. Wetland Information Needs**

Wetland inventories are an essential tool for effective wetland management, protection, and restoration. Such inventories provide baseline information for assessing the effectiveness of wetland policies and management actions. These data are used at all levels of government, as well as by private industry and non-profit organizations for wetland regulation and management, land use and conservation planning, environmental impact assessment, and natural resource inventories. A few local organizations in Minnesota have developed their own wetland inventories, but the NWI is the only spatially comprehensive wetland inventory for the entire state.

### **2.2. History**

In 1974, the US Fish and Wildlife Service directed its Office of Biological Services to design and conduct an inventory of the Nation's wetlands (Wilen and Bates 2004). Their mandate was to develop and disseminate a technically sound, comprehensive database concerning the characteristics and extent of the Nation's wetlands. The NWI has produced 1:24,000 scale maps for about 90% of the conterminous United States, relying primarily on aerial photo interpretation and other ancillary information on soils and topography.

NWI wetland maps were produced for Minnesota using aerial photography collected for the National High Altitude Program (NHAP) between 1979 and 1984 (LMIC 2007). These maps were originally produced as hard copy blue line maps (Figure 2.1), but were converted to digital maps in the early 1990s.

In 2006, an inter-agency partnership developed a comprehensive strategy for monitoring, assessing, and mapping wetlands in Minnesota. The Comprehensive Wetland Assessment Monitoring and Mapping Strategy (CWAMMS) identified three complimentary approaches to support a scientifically sound wetland monitoring and assessment program; (1) design and implement a random sample survey to track wetland status and trends, (2) develop an integrated system for tracking permit related accounting of wetlands, and (3) update the NWI for Minnesota (Gernes and Norris 2006).

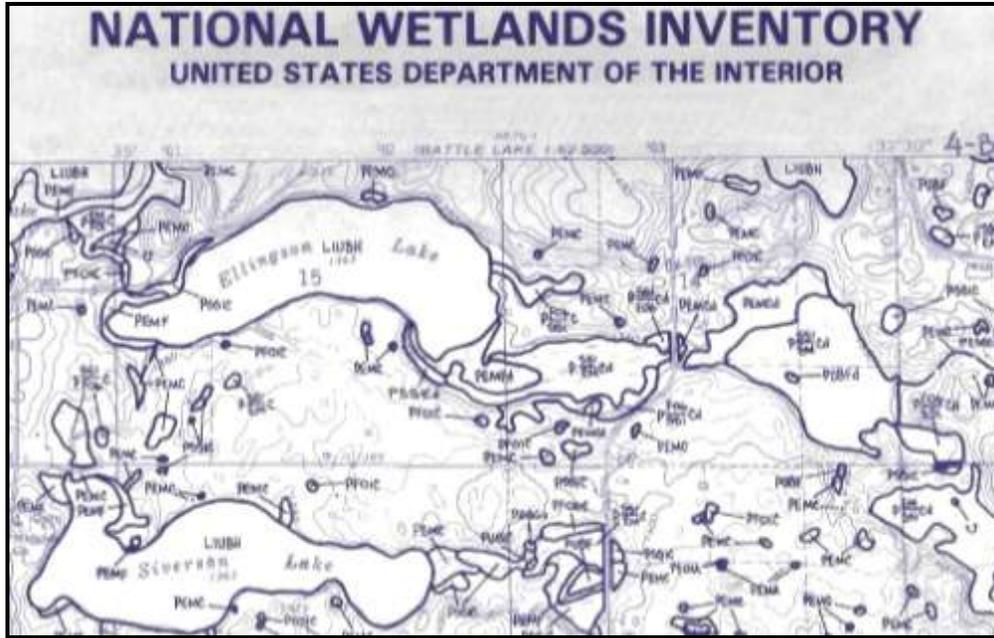


Figure 2.1: Scanned section of the original NWI paper maps.

### 2.3. Issues, Goals, and Objectives

This project aims to update and enhance the NWI for Minnesota.

There are a couple of issues with the original NWI data for Minnesota that limit its present utility. First and foremost, the data are about 25 to 30 years out of date. Many changes in wetland extent and type have occurred since the original NWI. Changes in the extent of agricultural and urban development have resulted in loss of wetlands. On the other hand changes in wetland policies and programs have resulted in the creation of new wetlands. Without an up-to-date wetland inventory, it is difficult to address our wetland planning and management needs. According to the management adage, you can't manage what you don't measure.

Second, various limitations in the original methodology and source data resulted in an under representation of certain wetland classes. There will always be some constraints on the ability to map wetlands; however, the portions of the state that were mapped with older 1:80,000 scale black and white imagery are a particular problem. Wetland maps in these areas tend to be very conservative, missing many forested and drier-end emergent wetlands (LMIC 2007).

Several specific objectives have been identified in support of the overall project goal of updating and improving the NWI.

- Identify methods and data sources that will improve the accuracy and efficiency of mapping wetlands
- Clearly define the requirements for an updated NWI necessary to meet the needs of end users and to be consistent with national standards for geospatial wetland data

- Acquire a consistent set of base imagery and as consistent as possible set of ancillary data
- Hire and oversee a qualified contractor to conduct the production of the updated NWI
- Establish a quality control program the ensure consistent, high-quality data
- Establish a multi-faceted data delivery program to meet the needs of end users
- Maintain effective communications with key stakeholder groups
- Design a process for keeping the data up-to-date

### 3. Project Organization

#### 3.1. Overview

The update of the National Wetland Inventory for Minnesota is a collaborative effort involving federal, state, and local agencies and organizations. The Ecological Resources Division of the Minnesota Department of Natural Resources (DNR) is responsible for coordinating this effort. Other key groups include: various end-users of these maps (stakeholders), the University of Minnesota Remote Sensing and Geospatial Analysis Laboratory, a mapping contractor, U.S. Fish and Wildlife Service, a technical advisory committee, and the DNR Enterprise Hydrography Team. The organizational relationship of these groups is shown in Figure 3.1. The composition and roles of these various groups is briefly discussed.

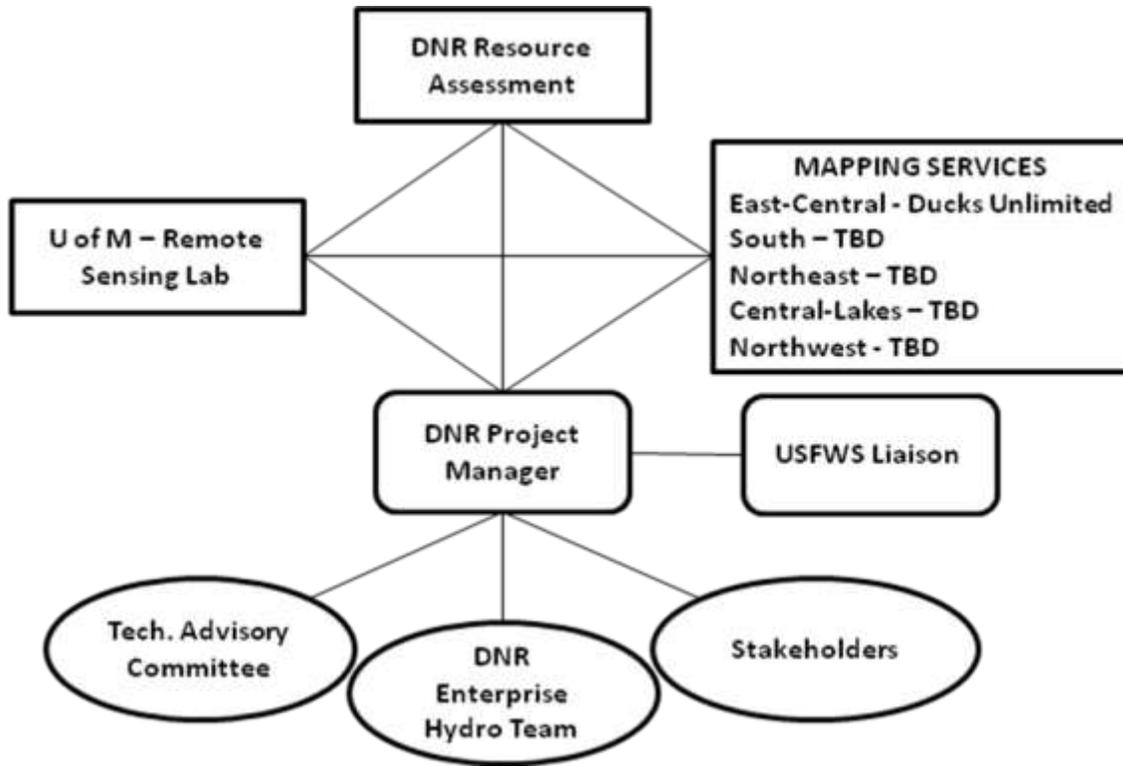


Figure 3.1: Organization structure for the NWI Update project..

## **DNR Project Manager**

The DNR is providing overall project management for the NWI Update. This includes overseeing project documentation, coordinating activities of the technical advisory committee, managing stakeholder communications, preparing and managing vendor contracts, ensuring quality control, and coordinating methods for data delivery.

### **3.2. Stakeholders**

Stakeholders will provide vital advice and information about how they use the NWI and what improvements they would like to have incorporated into the update. However, the stakeholders for the NWI Update for Minnesota are too numerous to have regular effective meetings. Various other techniques will be used to maintain communications with stakeholders include web surveys, e-mail distribution, occasional workshops, and select one-on-one interviews.

### **3.3. University of Minnesota – Remote Sensing Laboratory**

With the continuing evolution of aerial and satellite remote sensing technologies, there are many more options and combinations of systems with the potential to provide more accurate and timely wetland maps than were available when the original NWI was completed. The University of Minnesota - Remote Sensing Laboratory (UM – RSL) will lead the effort to compile and evaluate information on the best available methods for cost-effectively mapping wetlands for Minnesota.

### **3.4. DNR Resource Assessment Office**

The DNR Resource Assessment Office in Grand Rapids, Minnesota will provide a variety of mapping support services for this project including data preprocessing, wetland probability mapping, field data acquisition, and field verification.

### **3.5. Mapping Contractor**

The wetland-mapping contractor will be responsible for day-to-day production efforts for the National Wetland Inventory update. Contractor services will be procured through a standard competitive bid process. The project will be divided into phases with maps being updated for a different region in each phase. Each of the mapping efforts will be bid separately. The wetland-mapping contractor for each region will specify a project manager. The project manager for the wetland-mapping contractor will oversee all resource allocation, budgeting, training, and quality control internal to the contracting organization. The project manager for the wetland-mapping contractor will also act as the primary point of contact for the DNR project manager. The wetland-mapping contractor may also specify other internal roles as needed.

### **3.6. U.S. Fish and Wildlife Service**

One of the objectives of this project is to produce an updated wetland inventory consistent with wetland mapping national standards. As such, the regional NWI coordinator for the U.S. Fish and Wildlife Service will be responsible for ensuring that

national data standards are adequately addressed in the planning phase. The NWI coordinator will also be responsible for acting as a liaison USFWS headquarters staff that will be involved in reviewing the data for inclusion in the National Wetland Inventory database.

### 3.7. Technical Advisory Committee

The technical advisory committee will provide advice on various technical aspects of the project including review the methods assessment report and making recommendations on methodology, evaluating and commenting on the requirements document, providing input on proposed mapping approaches, and commenting on data deliverables. The technical advisory committee will be comprised of various wetland and GIS professionals from around the state (Table 3.1).

Table 3.1: Technical Advisory Committee

Member	Organization	Contact Info
Doug Norris	Minnesota DNR	<a href="mailto:doug.norris@dnr.state.mn.us">doug.norris@dnr.state.mn.us</a> 651-259-5125
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### 3.8. DNR Enterprise Hydrography Workgroup

The DNR Enterprise Hydrography Workgroup is responsible for addressing project impacts to existing DNR business processes and data sets as well as assisting with identifying and securing key DNR resources for this project. This team is comprised of key DNR staff dealing with water resource GIS data.

#### 4. Work Breakdown Structure Overview

The NWI Update will be conducted in phases (See schedule in section 6). This comprehensive project plan provides an overview of all tasks for the entire update. The plan entails a planning phase followed by four mapping phases. Mapping regions shown in Figure 4.1. The following phases have been funded.

- Phase 1 – Project coordination, initial project planning, methods assessment, requirements development, and data acquisition for northeastern and east-central Minnesota (funded 7/1/08)
- Phase 2 – Wetland map production for 13-counties in east-central Minnesota and data acquisition for 36 counties in southern Minnesota (funded 7/1/10)
- Phase 3 – Wetland map production for 30 counties in southern Minnesota and data acquisition for 22 counties in Central Minnesota (funding starts 7/1/12)

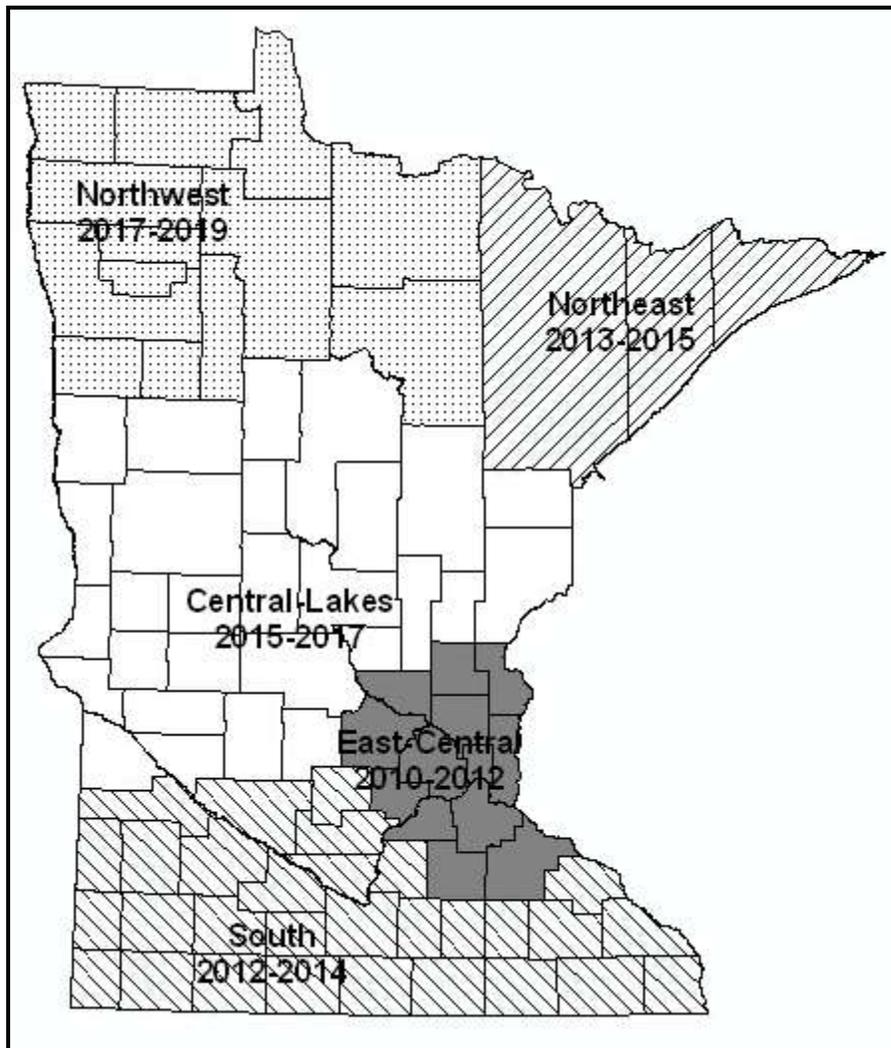


Figure 4.1: Mapping regions for the Minnesota NWI Update Project with fiscal year funding indicated.

#### 4.1. Requirements Development

Clearly defining the requirements is an essential part of all projects. For the NWI update, there are two components of this process: review of federal standards for wetland geographic data and assessing user needs.

##### 4.1.1. Review Wetland Data Standards

One of the objectives of this project is to develop an updated NWI for Minnesota that is consistent with national geospatial data standards in support of having the updated data entered into the U.S. Fish and Wildlife Service wetland database. The primary national geospatial data standard governing wetlands is the wetland mapping standard developed under the auspices of the Federal Geographic Data Committee (FGDC). This standard has been incorporated into the requirements document developed for this project.

##### 4.1.2. User Needs Assessment

A user needs assessment was conducted to help define the requirements. This assessment included a web survey of a broad cross section of end users. In addition, users were solicited through the web survey to participate in follow-up interviews. The information collected through this process was compiled and combined with information on geographic data standards for wetlands into a requirements document.

Table 4.1: User Requirement Deliverables

Deliverable	Date	Responsibility
Draft Requirements	1/31/2009	DNR
Final Requirements	4/30/2009	DNR

#### 4.2. Methods Evaluation

With the continuing evolution of aerial and satellite remote sensing technologies, there are many more options and combinations of systems with the potential to provide more accurate and timely wetland maps than were available when the original NWI was completed. The University of Minnesota - Remote Sensing Laboratory (UM – RSL) is leading the effort to compile and evaluate information on the best available methods for cost-effectively mapping wetlands for Minnesota. This effort is briefly summarized here. More details on the methods evaluation can be found in the methods evaluation reports from the University of Minnesota.

New image data types and approaches show promise for improving upon previous methods. A variety of image data types and mapping approaches are being evaluated for their suitability for wetland mapping in the pilot areas and the state as a whole. This process will result in mapping methods tailored to the different wetland types in Minnesota. Specific data types and mapping methods to be evaluated include:

- Radar image data – Radar data is particularly sensitive to soil moisture. Radar signals are also able to penetrate forest canopy. As such, radar data are well suited to identify wetlands that do not have standing water and also forested wetlands that might otherwise be obscured by forest canopy. The Canadian

government has begun using radar data in combination with color infra-red imagery for mapping wetlands as a part of the Canadian Wetland Inventory.

- LiDAR image data – LiDAR images provide highly detailed elevation data for ground features. The inclusion of LiDAR images in the mapping process can assist in identifying depressions, floodplains and other areas that may contain wetlands. LiDAR data are being collected for Minnesota. The methods assessment effort will help determine the best and most efficient way of incorporating this information in the NWI update.
- NAIP image data –The USDA National Agricultural Image Program (NAIP) collected high resolution digital aerial images for Minnesota in the summer of 2008, 2009, and 2010. The normal procedure in wetland mapping is to use images collected during the few weeks between snow melt and leaf emergence, so as to be able to identify wetlands before they are covered by tree canopies and at seasonally high water levels. However, summer imagery may make a valuable addition to the NWI update by improving classification accuracy of certain types of wetlands such as aquatic bed wetlands and improving the identification of farmed wetlands.
- Image segmentation – A relatively recent image processing technique called image segmentation will be evaluated. Traditional image processing techniques are used to discriminate different cover types based on statistical parameters (e.g. the range of color values) of image pixels. Image segmentation involves partitioning an image based upon context and texture. Image segmentation may improve the efficiency of wetland mapping by reducing the amount of time spent on manually digitizing wetland boundaries.
- Wetland probability maps – The current MN NWI delineates wetlands with polygons, so an area is either wetland or it is not. This is problematic for two reasons. First, natural wetlands rarely have such sharp boundaries. Depending on geologic setting and land use, the wetland to non-wetland transition may be very gradual, exhibited by dryer and dryer soil and slowly changing vegetative species the further one moves from the center of a wetland. Second, due to the gradual edge of some wetlands, determining where to draw the polygon boundary may be difficult. A wetland probability map is a continuous gridded surface representing the likelihood that any particular grid cell is a wetland. The probabilities are derived from factors such as slope, elevation, aspect, soil type, and vegetative species present. The main advantage of using a probability map is that wetland boundaries are flexible and can be identified based on the needs of a particular application. Wetland probability maps will be created for the pilot areas and will be compared with wetland boundaries derived from traditional mapping approaches. If the probability maps are accurate and valuable, it may be possible to use this technique to assist with the statewide mapping.

These image sources and mapping techniques will be tested on at least three pilot areas that represent a range of land cover regions in Minnesota. The pilot areas for this effort are:

- City of Chanhassen - Developing suburban area

- Carlton County (Fond du Lac Reservation) – Rural forested area
- Nicollet County (Swan Lake Area) – Rural agricultural area

Updated wetland inventory maps will be created for the pilot areas using the data type(s) and mapping method that provide the highest accuracy for each area. These inventory maps will be provided to stakeholders and the public on an interim basis until the statewide NWI update is complete.

The best performing wetland mapping protocols will be identified. Specific protocols will be recommended for the different areas of the state. The protocols and instructions will be documented and provided to the mapping team and other appropriate parties. Training and technical support will also be provided to the mapping team as needed in support of the recommended wetland mapping protocols.

Table 4.2: Methods Assessment Deliverables

Deliverable	Date	Responsibility
Pilot Area Wetland Map (Urban)	6/30/2010	UM-RSL
Mapping Protocol – Urban	6/30/2012	UM-RSL
Pilot Area Wetland Map (Forested)	9/30/2010	UM-RSL
Mapping Protocol – Forested	6/30/2012	UM-RSL
Pilot Area Wetland Map (Agricultural)	12/31/2012	UM-RSL
Mapping Protocol – Agricultural	6/30/2012	UM-RSL

### 4.3. Data Acquisition Planning

The primary data used for the update of the NWI in Minnesota will be aerial imagery. In addition, ancillary or collateral data including soils data, LiDAR elevation data, and radar may be incorporated as available to enhance wetland mapping accuracy. Some original data acquisition will be conducted for this project. Other data have already been acquired by other agencies and for other projects. The status of existing data will be summarized in the Data Availability Assessment Report, along with identifying critical data gaps. Additional data to be acquired for this project will be addressed in the Data Acquisition Plan.

Table 4.3: Data Acquisition Plan Deliverables

Deliverable	Date	Responsibility
Data Availability Assessment Report	1/31/2009	DNR
Draft Data Acquisition Plan	5/15/2009	DNR
Final Data Acquisition Plan	6/30/2009	DNR

### 4.4. Quality Assurance Planning

The DNR will develop a Quality Assurance Project Plan (QAPP) with input from the TAC. The QAPP will define quality control objectives, establish a standard for “ground-

truth” data, define accuracy requirements (position, feature, and attribute), and establish procedures for evaluating accuracy.

Table 4.4: Quality Assurance Plan Deliverables

Deliverable	Date	Responsibility
Draft Quality Assurance Plan	8/31/2009	DNR
Final Quality Assurance Plan	5/31/2010	DNR

## 4.5. Contract Management

Digital aerial imagery and updated NWI data for Minnesota will be produced for each project phase (Figure 4.1) under a competitive-bid contract to the Minnesota DNR. The process for a standard professional/technical services contract is outlined here. Contracting for aerial photography services will be coordinated with other state agencies such as the Minnesota Geospatial Information Office (MnGeo) to ensure efficient procurement of shared geospatial data.

### 4.5.1. Request for Proposal

The DNR project manager will prepare a Request for Proposal (RFP) in cooperation with other participating state agencies following the standard procurement procedures for the DNR. This includes developing the scope of work, preparing the Department of Administration Certification form, drafting the formal RFP, developing the selection criteria, and drafting the notice for the State Register.

### 4.5.2. Bid Evaluation/Selection

The contractors will submit sealed proposals. A selection committee will evaluate the proposals using the Best Value criteria with cost comprising at least 30% of the total score.

### 4.5.3. Contract Development

The DNR project manager will prepare a draft contract in cooperation with other participating state agencies using the standard contract form for professional/technical services and submit this to the selected contractor for their review. The DNR project manager will negotiate a final contract with support from DNR Office of Management and Budget Services. The required number of copies of the final contract will be routed for signature and the contract will then be executed.

#### 4.5.4. Contract Management

DNR project Manager will provide ongoing contract management services to ensure adequate progress toward contract goals, process vendor invoices, review overall project costs, and evaluate the quality and completeness of deliverables.

Table 4.5: Contract Management Deliverables

Deliverable	Date	Responsibility
Northeast Imagery RFP	1/31/2009	DNR
Northeast Imagery Contract	3/30/2009	DNR
East-Central Imagery RFP	12/31/2009	DNR/MnGeo
East-Central Imagery Contract	2/28/2010	DNR/MnGeo
East-Central Mapping RFP	7/1/2010	DNR
East-Central Mapping Contract	8/31/2010	DNR
South Imagery RFP	12/31/2010	DNR/MnGeo
South Imagery Contract	2/28/2010	DNR/MnGeo
South Mapping RFP	7/1/2012	DNR
South Mapping Contract	8/31/2012	DNR
Central Imagery RFP	12/31/2012	DNR/MnGeo
Central Imagery Contract	2/28/2013	DNR/MnGeo
Northeast Mapping RFP	7/1/2013	DNR
Northeast Mapping Contract	8/31/2013	DNR
Northwest Imagery RFP	12/31/2013	DNR/MnGeo
Northwest Imagery Contract	2/28/2014	DNR/MnGeo
Central Mapping RFP	7/1/2015	DNR
Central Mapping Contract	8/31/2015	DNR
Northwest Mapping RFP	7/1/2017	DNR
Northwest Mapping Contract	8/31/2017	DNR

## 4.6. Map Production

### 4.6.1. Contractor Workplan

The successful bidder for the map production contract will be required to develop and submit a workplan for this aspect of the project for review and approval by the DNR and the TAC. This workplan shall incorporate information on the methods and data that will be used to produce updated wetland inventory maps, project staffing requirements, a schedule of project milestones, status report frequency, and budget by project task.

Table 4.6: Map Production Deliverables

Deliverable	Date	Responsibility
East-Central Draft Wetland Data	7/1/2011 – 3/31/2012	Ducks Unlimited
East-Central Final Wetland Data	9/30/2012	Ducks Unlimited
East-Central Final QA/QC Report and Metadata	9/30/2012	Ducks Unlimited
South Draft Wetland Data	7/1/2013 – 3/31/2014	TBD
South Final Wetland Data	9/30/2014	TBD
South Final QA/QC Report and Metadata	9/30/2014	TBD
Northeast Draft Wetland Data	7/1/2014 – 3/31/2015	TBD
Northeast Final Wetland Data	9/30/2015	TBD
Northeast Final QA/QC Report and Metadata	9/30/2015	TBD
Central Draft Wetland Data	7/1/2016 – 3/31/2017	TBD
Central Final Wetland Data	9/30/2017	TBD
Central Final QA/QC Report and Metadata	9/30/2017	TBD
Northwest Draft Wetland Data	7/1/2018 – 3/31/2019	TBD
Northwest Final Wetland Data	9/30/2019	TBD
Northwest Final QA/QC Report and Metadata	9/30/2019	TBD

## 4.7. Data Management/Delivery

### 4.7.1. Data Format

Draft and final wetland inventory maps will be delivered in digital format to the DNR in geodatabase format consistent with the latest version of ArcGIS and with an attribute table structure consistent with the federal wetland mapping standard (FGDC 2008).

### 4.7.2. Storage and Back-Up

The data will be delivered to the DNR on portable hard drives along with a set of data on DVD for back-up. The DNR will store the data on its storage area network (SAN). The vendor will also keep a copy of the data for back-up for a period of at least two years after the completion of the contract.

### 4.7.3. Delivery Options

The data will be served on the DNR's public access website for geographic information, known as the DNR Data Deli (<http://deli.dnr.state.mn.us/>). The data will also be submitted by the DNR to the U.S. Fish and Wildlife Service for inclusion in the national wetland geodatabase, which can be accessed through a variety of mechanisms including the USFWS online Wetland Mapper and through Google Earth (<http://www.fws.gov/wetlands/data/index.html>).

Table 4.7: Data Management Deliverables

Deliverable	Date	Responsibility
East-Central Wetland Data Posted Online	12/31/2012	DNR
South Wetland Data Posted Online	12/31/2014	DNR
Northeast Wetland Data Posted Online	12/31/2015	DNR
Central Wetland Data Posted Online	12/31/2017	DNR
Northwest Wetland Data Posted Online	12/31/2019	DNR

## 5. Documentation, Reporting, and Communications

### 5.1.1. Workplan

This document serves as a comprehensive project plan for the statewide update of the NWI for Minnesota. This project plan will be reviewed and updated periodically (at least quarterly) to ensure that it accurately reflects the activities of the NWI update project. Additional details of various project components may be covered by sub-plans.

### 5.1.2. Related Documents

Additional documentation will be developed for the following key elements:

- Methods Assessment (UM)
- Quality Assurance (DNR)

- Data Acquisition (DNR)
- Map Production (Contractor)

These documents are incorporated into this comprehensive project plan by reference.

#### *5.1.3. Metadata*

Metadata (data about the data) will be developed for all geospatial deliverables produced under this project. Anticipated geospatial deliverables include; digital aerial imagery, wetland maps for pilots study areas, and updated NWI maps for the state of Minnesota. Metadata will comply with

#### *5.1.4. Reporting to LCCMR*

Semi-annual progress reports will be provided to the LCCMR to track progress toward key project milestones and budget expenditures. These reports will be prepared by the DNR project manager in January and July of each year using the template provided by the LCCMR.

#### *5.1.5. Contractor Reporting*

The mapping contractor will provide quarterly progress reports to the DNR project manager to track progress on project milestones and budget expenditures. Reports will be due in March, June, September, and December.

#### *5.1.6. TAC Communications*

The technical advisory committee will meet periodically, as needed, to discuss technical aspects of the project including reviewing and commenting on methodology, project requirements, quality control plans, and data deliverables. Meeting agendas will be e-mailed to all TAC members one week prior to each meeting and meeting notes will be e-mailed within one week of each meeting. Project documents will be posted at [www.dnr.state.mn.us/eco/wetlands/nwi\\_proj.html](http://www.dnr.state.mn.us/eco/wetlands/nwi_proj.html).

#### *5.1.7. Stakeholder Communications*

A web-based survey will be used to collect stakeholder input. Follow-up phone interviews will be made for a representative selection of survey respondents.

A database of stakeholder e-mail contacts will be developed and maintained by the DNR project manager. Periodic e-mail announcements will be sent to all interested parties.

Project documents will be posted at [www.dnr.state.mn.us/eco/wetlands/nwi\\_proj.html](http://www.dnr.state.mn.us/eco/wetlands/nwi_proj.html).

Newsletter articles will be published in various organizations including, but not limited to the DNR, the Wetland Professional Association, the University of Minnesota Water Resource Center, and the Minnesota GIS/LIS Consortium.

Occasional workshops will be held at key project milestones to present results from pilot studies, present draft data, and to solicit stakeholder feedback.

## 6. Schedule

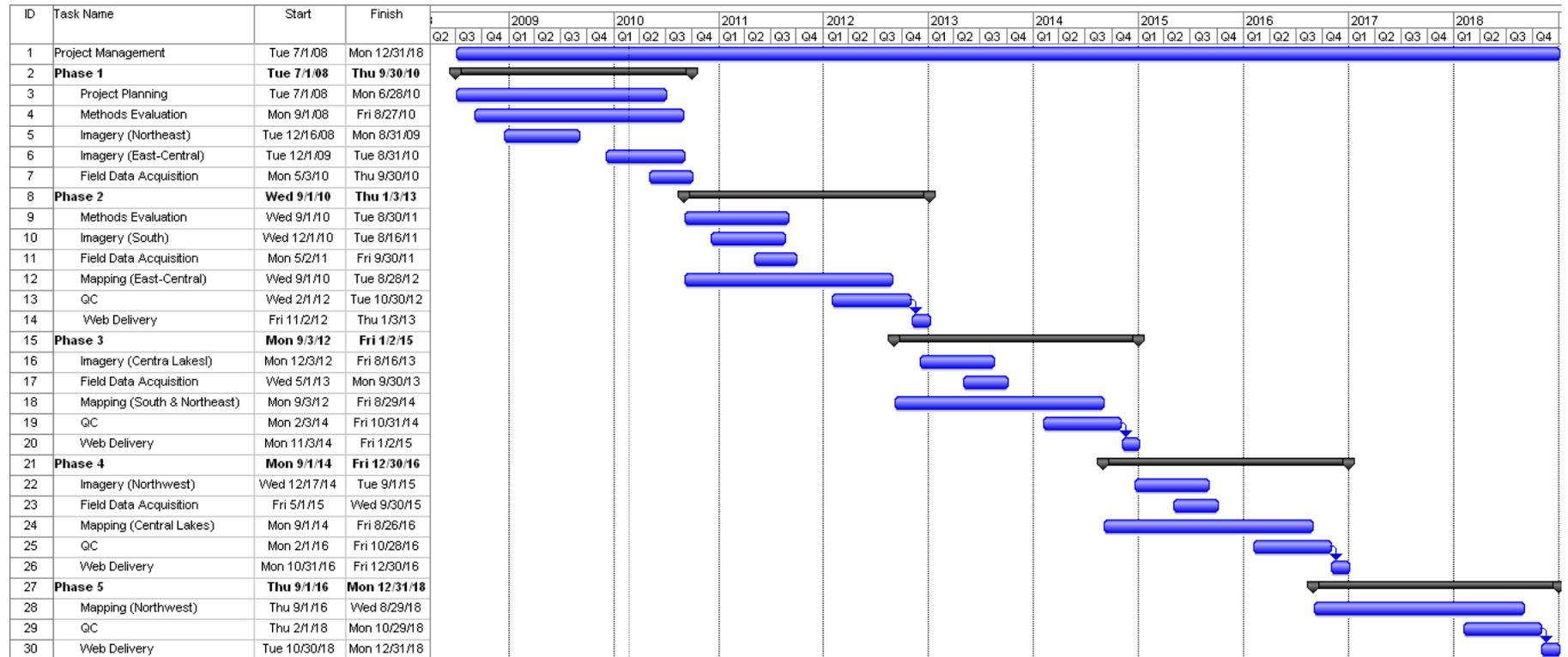


Figure 6.1: Project schedule for the NWI Update for Minnesota.

## 7. Budget

Planning-level budget estimates are provided below. This table does not portray actual expenditures. Detailed data on actual expenditures is available from the DNR financial reporting system and from the regular status reports provided to the LCCMR.

Table 7.1: Planning-level project budget

Fiscal Years	Imagery	Map Production	Methods Evaluation	Field Data	Project Mgmt	Total by Phase
2008 – 2010	\$140,000	\$0	\$200,000	\$80,000	\$130,000	\$550,000
2010 – 2012	\$463,000	\$324,000	\$100,000	\$82,000	\$139,000	\$1,108,000
2012 – 2014	\$464,000	\$812,000	\$0	\$84,000	\$148,000	\$1,508,000
2013 – 2015	\$358,000	\$967,000	\$0	\$88,000	\$157,000	\$1,570,000
2015 – 2017	\$0	\$1,598,000	\$0	\$0	\$166,000	\$1,764,000
2017 – 2019	\$0	\$1,399,000	\$0	\$0	\$176,000	\$1,575,000

TOTAL = \$8,075,000

## **8. References**

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