

# **Clean Water Act §319(h) Nonpoint Source Grant Program**

## ***Coordinating Implementation of the Lower Nueces River Watershed Protection Plan Water Hyacinth Infestation Source Investigation***

**TSSWCB Project # 15-09  
Revision 0**

### **Quality Assurance Project Plan**

#### **Texas State Soil and Water Conservation Board**

Prepared by  
Nueces River Authority

Effective Period: Upon USEPA approval through October 2017  
with annual revisions required

Questions concerning this quality assurance project plan should be directed to:

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**Section A1 Approval Sheet**

Quality Assurance Project Plan (QAPP) for the *Coordinating Implementation of the Lower Nueces River Watershed Protection Plan – Water Hyacinth Infestation Source Investigation*.

**United States Environmental Protection Agency (USEPA), Region VI**

Name: Curry Jones  
Title: USEPA Chief State/Tribal Programs Section

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: Henry Brewer  
Title: USEPA Texas Nonpoint Source Project Officer (PO)

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Texas State Soil and Water Conservation Board (TSSWCB)**

Name: Jana Lloyd  
Title: TSSWCB Project Manager (PM)

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: Mitch Conine  
Title: TSSWCB Quality Assurance Officer (QAO)

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Nueces River Authority (NRA)**

Name: Rocky Freund  
Title: Deputy Executive Director / NRA PM

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

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## List of Acronyms and Abbreviations

BRC	Texas A&M AgriLife Research & Extension – Blackland Research Center
CAR	Corrective Action Report
CRP	Clean Rivers Program
DQO	Data Quality Objective
DVD	Digital Video Disc
USEPA	United States Environmental Protection Agency
FM	Farm to Market Road
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
NRA	Nueces River Authority
NRWP	Nueces River Watershed Partnership
PM	Project Manager
PO	Project Officer
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QAO	Quality Assurance Officer
QC	Quality Control
SH	State Highway
SWPP	Source Water Protection Plan
TDS	Total Dissolved Solids
TCEQ	Texas Commission on Environmental Quality
TSSWCB	Texas State Soil and Water Conservation Board
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WPP	Watershed Protection Plan

## Unit Abbreviations

mg/l	milligrams per liter
NTU	Nephelometric Turbidity Unit
µg/l	micrograms per liter

**Section A3: Distribution List**

Organizations, and individuals within, which will receive copies of the approved QAPP and any subsequent revisions include:

**United States Environmental Protection Agency, Region VI (USEPA)**

1445 Ross Avenue, Suite 1200 (6WQ-AT)  
Dallas, TX 75202-2733

Name: Curry Jones  
Title: USEPA Chief State/Tribal Programs Section

Name: Henry Brewer  
Title: USEPA Texas Nonpoint Source PO

**Texas State Soil and Water Conservation Board (TSSWCB)**

PO Box 658  
Temple, TX 76503

Name: Jana Lloyd  
Title: TSSWCB PM

Name: Mitch Conine  
Title: TSSWCB QAO

**Nueces River Authority (NRA)**

400 Mann St. Suite 1002  
Corpus Christi, TX 78401

Name: Rocky Freund  
Title: Deputy Executive Director

#### **Section A4: Project/Task Organization**

The following is a list of individuals and organizations participating in the project with their specific roles and responsibilities:

**USEPA** – Environmental Protection Agency, Region 6, Dallas, Texas. Provides project oversight and funding at the federal level.

Henry Brewer, USEPA Texas Nonpoint Source PO

Responsible for overall performance and direction of the project at the federal level. Ensures that the project assists in achieving the goals of the Clean Water Act. Reviews and approves the QAPP, project progress, and deliverables.

**TSSWCB** – Texas State Soil and Water Conservation Board, Temple, Texas. Provides project overview at the State level.

Jana Lloyd, TSSWCB PM

Responsible for ensuring that the project delivers data of known quality, quantity, and type on schedule to achieve project objectives. Tracks and reviews deliverables to ensure that tasks in the workplan are completed as specified. Reviews and approves QAPP and any amendments or revisions and ensures distribution of approved/revised QAPPs to TSSWCB participants.

Mitch Conine, TSSWCB QAO

Reviews and approves QAPP and any amendments or revisions. Responsible for verifying that the QAPP is followed by project participants. Monitors implementation of corrective actions. Coordinates or conducts audits of modeling procedures. Determines that the project meets the requirements for planning, quality assurance (QA), quality control (QC), and reporting under the TSSWCB Clean Water Act §319(h) Nonpoint Source Grant Program.

**NRA** – Nueces River Authority, Corpus Christi, Texas. Provides project coordination and administration, coordinates QA, and modeling.

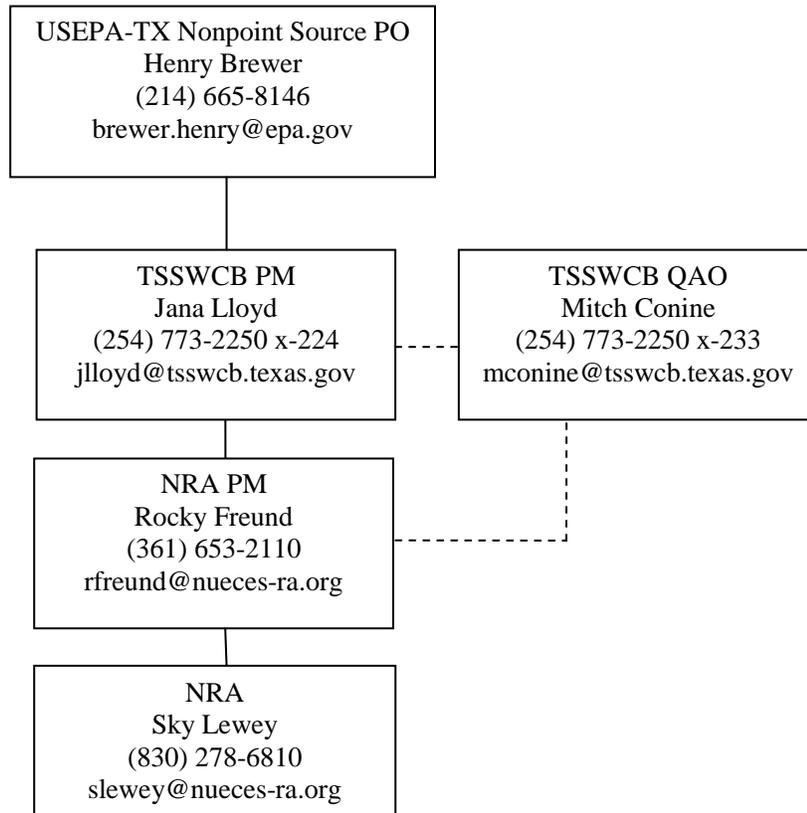
Rocky Freund, NRA Deputy Executive Director,

Responsible for ensuring the smooth operation of the project, timely delivery of quality deliverables and general project coordination and administration at the local level. Coordinates contractor activities and inclusion of and survey results into a final report. Facilitates the watershed steering committee and implementation of the watershed protection plan (WPP). Responsible for development of data quality objectives (DQOs) and QAPP. Responsible for data acquisition.

Sky Lewey, Resource Protection and Education Director

Responsible for assisting with the development of the DQOs and QAPP. Responsible for assisting with data acquisition.

**Figure A4-1. Project Organization Chart**

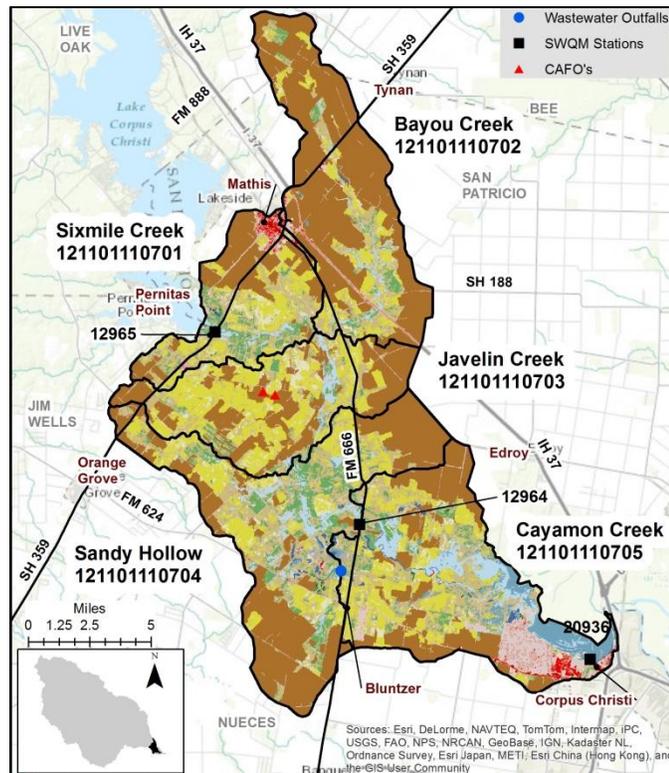


## Section A5: Problem Definition/Background

The Lower Nueces River is 39 river miles long and is located primarily in parts of Jim Wells, Nueces, and San Patricio Counties. A very small portion in the northern end of the watershed is located in Bee and Live Oak counties. The 116,862-acre watershed is primarily agricultural (cultivated crops hay, and pasture lands). The City of Corpus Christi, population 305,215, lies at the downstream end of the segment, but only a small portion (<1%) falls within the watershed boundary. The City of San Patricio, population 395, is located in the middle of the watershed near the river along Farm to Market Road (FM) 666. 83% of the City of Mathis, population 4,936, is located in the watershed between the river and the Bayou Creek tributary. There are no permitted wastewater treatment facilities in the watershed. The wastewater permit annotation in Figure A5-1 is a no-discharge permit for a sand and gravel operation in the event of excessive rainfall events. There are only two road crossings on this segment – State Highway (SH) 359 just below Wesley Seale Dam at Lake Corpus Christi and FM 666.

Water quality monitoring at SH 359 (12965) and FM 666 (12964) has been conducted since 1977. These locations are shown in Figure A5-1. Early sampling was conducted by the City of Corpus Christi and the United States Geological Survey (USGS). NRA began routine quarterly sampling under the Texas Commission on Environmental Quality's (TCEQ) Clean Rivers Program (CRP) in 1998. A third site at Hazel Bazemore Park (20936) was added to the CRP routine quarterly sampling beginning Fiscal Year (FY) 2011. An additional site just upstream of the saltwater barrier dam is planned to begin in the last quarter of FY 2016.

State and federal water resource management and environmental protection agencies have embraced the watershed approach for managing water quality. The watershed approach involves assessing sources and causes of impairments and potential impairment concerns, and utilizing this information to develop and implement watershed management plans. The draft 2014 303(d) list indicates the Lower Nueces River (Segment 2102) is impaired for total dissolved solids (TDS) and has a concern for chlorophyll-*a*. The average TDS level of 621 mg/l exceeds the 500 mg/l standard. The chlorophyll-*a* concern is based on 11 of 33 samples in Assessment Unit (AU) 01 and 14 of 28 samples in AU\_02 exceeding the 14.1 µg/l. The



**Figure A5-1. Lower Nueces River Watershed**

WPP was developed to address these issues as well as sediment issues in the Lower Nueces River watershed.

A turbidity spike (from 20 NTU to 1,900 NTU) in November 2009 resulted in a drinking water violation at the City of Corpus Christi O.N. Stevens Water Treatment Plant. A sediment loading model, developed by USGS, indicated that the turbidity increase was most likely due to localized, heavy rainfall in the Bayou Creek tributary. The land use in the Bayou Creek watershed is primary farmland, which was bare after crop harvest at the time of the storm event. However, major bank manipulation by landowners, may also be contributing to the problem.

The Lower Nueces River is the primary drinking water source for nearly 500,000 people in the Coastal Bend Region and also supplies industrial users in the area. The water is released from Lake Corpus Christi and travels approximately 39 miles to water treatment plant intakes. Better water quality reduces treatment costs and allows industry to cycle water through their cooling towers for longer periods of time, reducing the overall amount of water needed for their operations.

The City of Corpus Christi contracted with NRA (FYs 2011 and 2012) to develop a Source Water Protection Plan (SWPP) to provide evaluation and cost estimates of best management practices to help protect the river and the water it provides. It was modeled after USEPA's Elements of Successful WPPs.

Building off of the SWPP, the development of the Lower Nueces River WPP was funded through a federal Clean Water Act §319(h) grant to the NRA, administered by the TSSWCB from the USEPA (FYs 2013 thru 2015). The purpose of this project was to develop a nine element WPP for the Nueces River Below Lake Corpus Christi Watershed by: providing direction for a stakeholder group to serve as a decision-making body, identifying potential nonpoint source pollution threats and/or concerns, conducting pollutant load evaluations, identifying management measures to reduce and protect water quality, as well as conducting education and outreach activities.

The Nueces River Watershed Partnership (NRWP) was formed to serve as a means to gather stakeholder input and direction in development of the SWPP and WPP. The NRWP met regularly during development of both plans and workgroups were formed to address specific topics. The mission statement of the NRWP, developed by the Education and Outreach workgroup and adopted by the full NRWP is *"To improve and protect the water quality of the Nueces River Watershed so that the river is restored and preserved for current and future generations."* The WPP and SWPP documents are available on the NRWP website <http://www.nuecesriverpartnership.org/>.

The purpose of this project is to begin implementation of the Lower Nueces River WPP by:

- Assisting governmental and non-governmental organizations in the Lower Nueces River watershed in identification and acquisition of resources (financial and technical) to assist with WPP implementation; actively seeking and pursuing funding

opportunities and working with partners to develop grant proposals; and working with state and federal agencies, as appropriate, to bring technical and financial resources to the watershed.

- Evaluating and tracking progress toward achieving milestones established in the WPP; and assessing water quality data collected through the CRP and other data collection efforts in relation to achieving load reductions.
- Coordinating and conducting water resources and related environmental outreach/education efforts across the watershed such as local community clean-ups, Texas Watershed Steward Program, Riparian Management workshops, rainwater harvesting workshops, Texas Well Owner Network trainings, well screening events, Texas Stream Team volunteer monitoring trainings, the grazing cattle component of Lone Star Healthy Stream; and working with collaborating entities to organize OSSF maintenance workshops for homeowners.
- Conducting an aerial reconnaissance to determine the upper extent, and possible source, of the water hyacinth and updating the Hyacinth Management Plan.  
(Appendix G of the Lower Nueces River WPP:  
[http://www.nuecesriverpartnership.org/pdfs/LNRWPP\\_Final\\_April\\_2016.pdf](http://www.nuecesriverpartnership.org/pdfs/LNRWPP_Final_April_2016.pdf))

## **Section A6: Project Goals and Task Description**

Water hyacinth is a free-floating perennial aquatic plant. It is prolific and can double its population in a short amount of time. When left uncontrolled, water hyacinth can completely cover the surface water of lakes, ponds, and sections of rivers. This blocks sunlight from reaching native aquatic plants and reduces oxygen level, which could result in a reduction of aquatic life such as fish and turtles.

NRWP stakeholders have voiced concerns about the rapid spread of large colonies of water hyacinth (or other invasive species) and their effect on water quality, aquatic environment, riparian habitat, and its obstruction to water flow. Areas of the river being completely covered by water hyacinth have been documented on a number of occasions. The City of Corpus Christi has previously removed water hyacinth from the river, but no routine maintenance has been established in order to prevent re-occurrence.

NRA subcontracted with Texas A&M AgriLife Research and Extension – Blackland Research Center (BRC) to conduct an evaluation of the river to document large debris using side scan sonar and was asked to report on any water hyacinth colonies they observed. In April 2014, BRC surveyed the river from the saltwater barrier to approximately 12 miles upstream. At this point the river became too shallow for the boat. There is no access to launch a boat above this point. They reported seeing no significant water hyacinth colonies during their survey.

During development of the Lower Nueces River WPP, NRA subcontracted with licensed helicopter services to conduct the two hyacinth surveys of the rivers. These took place in February and August 2015. NRA personnel took geo-referenced photographs and a continuous stream of still photographs (one photo every 2 seconds). NRA personnel conducted a short on-the-river survey to document location and size of at least one area of infestation after the first survey. The average colony size was 1,120 square feet. Based on these observations, it was estimated that 3.21 acres of water hyacinth were present at this time. For the second survey, it was estimated that the colonies identified were about ¼ of the average size of colonies observed in February, for estimated average colony size of 280 square feet and approximately 0.34 acres.

Water hyacinth has long been documented as a problem in Lake Corpus Christi and has been the subject of continued and ongoing control efforts by TPWD and the City of Corpus Christi. The hyacinth along the banks of Lake Corpus Christi flourished after flooding that occurred in May and June 2015. City of Corpus Christi personnel from Wesley Seale Dam were spraying areas about twice a week using Rodeo®, an aquatic herbicide, mixed with a surfactant.

The objective of this survey is to conduct an additional survey above Lake Corpus Christi to try and locate the source / upper extent of the hyacinth (Figure A6.1). As learned from the two surveys flown in 2015, the best time to fly is early morning before the wind picks up. This allows for the pilot to fly at about 20 miles per hour at an elevation of approximately 50' above the trees. NRA personnel will take geo-referenced photographs and a continuous stream of still photographs (one photo every 2 – 5 seconds) along approximately 20 river



## **Section A7: Quality Objectives and Criteria**

Implementation of Lower Nueces River WPP includes investigation of the source of water hyacinth survey, thought to be between US 59 and the upper extent of Lake Corpus Christi (Segment 2103). Data obtained during this survey will meet the data needs presented in Section A6.

### **Precision**

Precision is the ability of a measurement to be consistently reproduced; the number of significant digits to which a value has been reliably measured. It is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error. In reference to this project, precision will be determined by the ability to compare photographs collected during the course of the survey to Google Earth in order to obtain Global Positioning System (GPS) coordinates of the upper extent of the water hyacinth.

### **Accuracy**

Accuracy is the ability of a measurement to match the actual value of the quantity being measured; it is the degree of agreement between a measured or computed value of a physical quantity and the standard or accepted value for that quantity. In reference to this project, accuracy will be determined by the ability to reasonably estimate the location of the upper extent of the hyacinth colonies based on the correlation of the photographs to Google Earth. Google Earth depends on the accuracy of the GPS satellites from which it gathers its information. A geographic information system (GIS) layer will be created to be able to easily display the location information on maps.

The aerial photographs will be taken with a Sony Cyber-shot DSC-HX100V camera with 16.2 megapixels resolution and equipped with GPS. Latitude and longitudes plotted from some photos have been off by up to 50'. This distance will be close enough to accurately locate the area on Google Earth. A GoPro® Hero 3 Black Edition will be used to record the continuous stream of still photographs. The camera settings for both cameras are adjusted to automatic focus with no zoom. Both cameras utilize stock lens. No additional lens or filters are used. Resolution settings are the highest available: 4.3 16 M for the Cyber-shot and 12MP wide for the GoPro®. The Cyber-shot is equipped with a 16 GB disk and the GoPro® with a 32 micro disc.

The cameras are used as documentation tools to accomplish the survey, but the imagery is not used to measure population size, but to acquire locational information.

### **Representativeness**

Representativeness is the degree to which the photographs document the upper extent of the hyacinth colonies.

**Completeness**

The GoPro® will be used to record a continuous stream of photographs over the upper lake and the river during the entire flight for 100% coverage. The quality and number of photos will be adequate to document the upper extent of the hyacinth on this segment and determine possible sources of further infestation to Lake Corpus Christi.

**Section A8: Special Training Requirements/Certification**

NRA staff have received the appropriate experience, education and/or training required to adequately perform their duties. No special certifications are required. Personnel involved in the use of GPS instruments have training and/or expertise regarding their appropriate use.

**Section A9: Documentation and Records**

All records, including notebooks and electronic files, will be archived by NRA for at least five years. Notes and photographs will be stored on the PM’s computer and on a thumb drive. Electronic data on the project computer are backed up daily to the primary network drive. The network drive is backed up monthly to a secondary/redundant network drive and to digital video discs (DVDs). In the event of a catastrophic systems failure of the project computer, the primary network drive can be used to restore the data in less than one day’s time. Data generated on the day of the failure may be lost, but can be reproduced from raw data in most cases. In the event of a catastrophic systems failure of the primary network drive, project data on the secondary network drive will be brought up to date with the information on the project computer.

Corrective Action Reports (CARs) will be utilized when necessary (Appendix A). CARs document root cause, impact, specific corrective action to address the deficiency, action to prevent recurrence, individuals responsible for each action, the timetable for completion of each action, and the means by which completion of each corrective action will be documented. CARs will be included with quarterly progress reports and will be maintained in an accessible location for reference at NRA. CARs resulting in any changes or variations from the QAPP will be made known to pertinent project personnel and will result in an amendment to the QAPP. In addition, significant conditions (situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TSSWCB immediately both verbally and in writing.

**Table A9-1 Project Documents and Records**

Document/Record	Location	Retention	Form
QAPP, amendments, and appendices	NRA	5 years	Paper/Electronic
QAPP distribution documentation	NRA	5 years	Paper/Electronic
CARs	NRA	5 years	Paper/Electronic
Notes and photographs	NRA	5 years	Paper/Electronic
Progress reports/ Final Reports	NRA/TSSWCB	5 years	Paper/Electronic

TSSWCB may elect to take possession of records at the conclusion of the specified retention period. The notes and photographs will be delivered to the TSSWCB as requested.

**QAPP Amendments**

Amendments to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; address deficiencies and non-conformances; improve operational efficiency; and/or accommodate unique or unanticipated circumstances. Requests for amendments are directed from the NRA PM to the TSSWCB PM in writing. The changes are effective immediately upon approval by the TSSWCB PM and QAO, or their designees, and the USEPA PO. Amendments to the QAPP and the reasons for the changes will be documented and distributed to all individuals on the QAPP distribution list by the NRA PM. Amendments shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process.

### **QAPP Revisions**

This QAPP shall be revised as necessary and reissued annually on the anniversary date, or revised and reissued within 120 days of significant changes, whichever is sooner. The last approved version of the QAPP shall remain in effect until a revised version has been fully approved by the TSSWCB PM and QAO and the USEPA PO; the revision must be submitted to the TSSWCB for approval before the last approved version has expired. If the entire QAPP is current, valid, and accurately reflects the project goals and the organization's policy, the annual re-issuance may be done by a certification that the plan is current. This can be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP.

**Section B1: Sampling Process Design (Experimental Design)**

NRA will subcontract with a licensed helicopter service to conduct the hyacinth survey of the upper lake and river. NRA personnel will be on the flight to take geo-referenced photographs (camera pointed straight down) and a continuous stream of photographs (one photo every 2 – 5 seconds) during the survey. The photographs will be compared to Google Earth to help verify the coordinates of the upper extent of the hyacinth colonies. The survey will be conducted during the summer months. It will be scheduled for early morning before the wind picks up, flying at about 20 miles per hour at an elevation of approximately 50' above the trees. The targeted reach of the river is approximately 20 miles long, so the survey itself will take about an hour.

## **Section B2: Data Collection Methods**

Aerial photographs will be taken with a GPS-equipped Sony Cyber-shot DSC-HX100V camera with 16.2 megapixels resolution. Images are shot with the camera pointed straight down over hyacinth colonies. The accuracy of the latitude and longitudes plotted from some photos may vary by up to 50'. This distance is sufficient to accurately locate the area on Google Earth. A GoPro® Hero 3 Black Edition will be used to record the stream of still photographs (one photo every 2 – 5 secs) for up to 1,800 photos.

This methodology for acquiring and using imagery to evaluate the hyacinth's location is based on NRA's experience in measuring extent and density of invasive plant populations along other river segments within the Nueces Basin over the past six years involving the use of the same or similar helicopters and camera equipment. The method works for estimating scarce and distinct populations. The quality of imagery is less important than the geo-reference tag and sequence in which images are shot.

**Section B3: Sample Handling and Custody Requirements**

A series of photographs, along with GPS coordinates, will be collected as part of this evaluation. All photographs will be logged electronically and transferred to backup electronic media.

#### **Section B4: Analytical Methods**

The geo-reference photographs will be compared to Google Earth to help verify the upper extent of the hyacinth colonies. A GIS layer will be created to be able to easily display the location information on maps. This information will be used to develop a control program that is focused and well delivered, beginning at the uppermost extent and working downstream.

## **Section B5: Quality Control Requirements**

Comparison of the GPS locations recorded on the photographs recorded during the survey to Google Earth and will serve as a QC check.

The primary requirement for judging acceptability of imagery is the usefulness of the imagery in determining extent and density of hyacinth populations. In performing this task, NRA is relying on its experience in measuring extent and density of invasive plant populations along other river segments within the Nueces Basin over the past six years involving the use of same or similar helicopters and camera equipment. Imagery shot using this methodology has proven useful in examining presence, extent, and density of invasive plant populations and in the design of control programs.

Image quality, i.e. resolution, color separation, etc., is not so important for this purpose. The primary requirement for acceptability is the geo-reference tag and the number of images collected, each documenting a distinct population or hyacinth colony.

**Section B6: Equipment Testing, Inspection, & Maintenance Requirements**

All equipment, including battery life, will be inspected and confirmed to be in operating order according to manufacturer's specifications, prior to the helicopter survey. Extra batteries will be included for use if needed during the survey.

## **Section B7: Instrument Calibration and Frequency**

Although no calibration of GPS is necessary, a position confidence check will be conducted through standard static techniques. Surveyed values will be reviewed to assure target horizontal accuracy is achieved.

The 2 second time-lapsed setting for GoPro® is sufficient to provide a string of overlapping images. The primary purpose of the GoPro® images is for reference. Reviewing a particular area of the river can be accomplished by scrolling through the overlapping images.

Since none of the collected imagery is being used to measure things, the auto focus settings work fine whether the aircraft is traveling at 100 feet above the subject or at 50 feet above. The importance of the imagery lies within the documentation of location and number of colonies.

**Section B8: Inspection/Acceptance Requirements for Supplies and Consumables**

No significant consumables are required because all data are digitally recorded.

**Section B9: Data Acquisition Requirements (Non-direct Measurements)**

Additional GIS layers used to create maps will be obtained from agencies such as TCEQ, United States Department of Agriculture – Natural Resources Conservation Service, USGS, Texas Water Development Board, and any other entities, not directly mentioned, that maintain and make available accurate, state-wide information.

A GIS point layer will be created to document the locations identified in this survey. This layer will be added to maps that are generated to display geographic extent. The maps will be used to update the Hyacinth Management Plan and provide information for any other reports that may be written.

## **Section B10: Data Management**

### **Backup and Disaster Recovery**

Electronic data on the project computer are backed up daily to the primary network drive. The network drive is backed up monthly to a secondary/redundant network drive and to DVDs. In the event of a catastrophic systems failure of the project computer, the primary network drive can be used to restore the data in less than one day's time. Computer data generated on the day of the failure may be lost, but can be reproduced from raw data in most cases. In the event of a catastrophic systems failure of the primary network drive, project data on the secondary network drive will be brought up to date with the information on the project computer.

The project computer is a Dell Optiplex 7010 with an Intel Core i5-3550 CPU @3.30GHz and 6 GB RAM installed. The operating system is Microsoft Windows 7 Professional 64-bit with Service Pack 1. The backups for the project computer are generated by Macrium Reflect software as well as Windows 7 native backup software. Backups are scheduled daily to a Western Digital 2 TB USB v3 device and weekly to a primary network file server.

The primary network file server is a custom build Intel DG33TL with Intel Core 2 Duo CPU E8400 @ 3.0 GHz and 3GB of RAM. The software on the Primary file server is Microsoft Windows XP Professional version 2002 Service Pack 3. All data on the primary file server is stored on a 2TB Seagate internal SCSI hard drive. The data stored on the primary file server is copied monthly DVDs and to a secondary file server for redundancy.

The secondary file server is a Dell Optiplex 380 with an Intel Pentium 4 CPU @ 3.2 GHz and 2 GB of RAM. The operating system on the secondary network file server consists of Microsoft's Windows 7 Professional Service Pack 1 32-bit.

### **Archives and Data Retention**

All records, including notebooks and electronic files, will be archived by NRA for at least five years. Notes and photographs will be stored on the PM's computer and on a thumb drive.

**Section C1: Assessments and Response Actions**

Table C1-1 presents the types of assessments and response actions for activities applicable to the QAPP.

**Table C1-1 Assessments and Response Actions**

Assessment Activity	Approximate Schedule	Responsible Party(ies)	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	NRA	Monitoring of the project status and records to ensure requirements are being fulfilled. Monitoring and review of performance and data quality.	Report to project lead in Quarterly Report
Technical Systems Audit	Minimum of one during the course of this project.	TSSWCB QAO	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Facility review and data management as they relate to the project.	30 days to respond in writing to the TSSWCB QAO to address corrective actions

Project deliverables will be quality controlled by the TSSWCB PM in-house review. The TSSWCB PM will maintain overall responsibility for examining NRA’s work to ensure methodologies and processes are consistent with the procedures outlined in this QAPP.

The TSSWCB QAO (or designee) may conduct an audit of the technical systems activities for this project as needed. The NRA PM will have the responsibility for initiating and implementing response actions associated with findings identified during the on-site audit. Once the response actions have been implemented, the TSSWCB QAO (or designee) may perform a follow-up audit to verify and document that the response actions were implemented effectively. Records of audit findings and corrective actions are maintained by the TSSWCB PM and NRA PM. Corrective action documentation will be submitted to the TSSWCB PM within 30 days of receiving audit findings. If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work is specified in agreements or contracts between participating organizations.

## **Section C2: Reports to Management**

Quarterly progress reports developed by the NRA PM will note activities conducted in connection with the hyacinth survey, items or areas identified as potential problems, and any variations or supplements to the QAPP. Quarterly progress reports will be submitted to the TSSWCB PM. CAR forms will be utilized when necessary (Appendix A). CARs will be maintained in an accessible location for reference at NRA. CARs that result in any changes or variations from the QAPP will be made known to pertinent project personnel and documented in an update or amendment to the QAPP.

If the procedures and guidelines established in this QAPP are not successful, corrective action is required to ensure that conditions adverse to quality data are identified promptly and corrected as soon as possible and will be reported to the NRA PM and TSSWCB PM immediately both verbally and in writing. Problems that could possibly occur and result in an incomplete or delayed survey include: camera malfunction, insufficient battery life, dropping / losing a camera, or mechanical problems with the helicopter which would require terminating the survey early. Corrective actions include identification of root causes of problems and successful correction of identified problem. CARs will be filled out to document the problems and the remedial action taken. Copies of CARs will be included in quarterly progress reports. Following any audit performed, a report of findings, recommendations and responses are sent to the TSSWCB PM in the quarterly progress report.

The Hyacinth Control Management Plan, developed as part of the WPP, will be updated with information obtained during the survey. The update will include: a description of the methodologies utilized; a detailed narrative regarding specific findings; and a discussion and conclusions section that highlights the implications of these findings.

## **Section D1: Data Review, Validation and Verification**

All generated data will be reviewed, validated, and verified against the data quality objectives outlined in Section A7, "Quality Objectives and Criteria." Only those data that are supported by appropriate QC will be considered acceptable for use.

The procedures for verification and validation are described in Section D2, below. The NRA PM is responsible for validating that all data collected meet the DQOs of the project and are suitable for reporting.

**Section D2: Validation Methods**

The photographs will be compared to Google Earth to obtain coordinates of the upper extent of the hyacinth colonies.

### **Section D3: Reconciliation with User Requirements**

Results of the hyacinth survey will be incorporated into the management plan for control and removal. The management plan will also (1) determine whether further water quality sampling, in addition to routine CRP monitoring, should be conducted; and (2) determine whether periodic surveys of hyacinth growth should be conducted.

DQOs for accuracy will be achieved by meeting the 100% coverage of the survey route documented as a GIS map.

## **APPENDIX A**

### **Corrective Action Report**

**Corrective Action Report**

**SOP-QA-001**

**CAR #:** \_\_\_\_\_

Date: \_\_\_\_\_

Area/Location: \_\_\_\_\_

Reported by: \_\_\_\_\_

Activity: \_\_\_\_\_

State the nature of the problem, nonconformance or out-of-control situation:

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Possible causes:

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Recommended Corrective Actions:

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CAR routed to: \_\_\_\_\_

Received by: \_\_\_\_\_

Corrective Actions taken:

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Has problem been corrected?:

YES

NO

Immediate Supervisor: \_\_\_\_\_

Program Manager: \_\_\_\_\_

NRA Quality Assurance Officer: \_\_\_\_\_

TSSWCB Quality Assurance Officer: \_\_\_\_\_