The Detroit River Hawk Watch Monitoring Protocol: A Review and Implementation for Scientific Integrity

June 2011

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Suggested citation: Detroit River Hawk Watch. 2011. The Detroit River Hawk Watch Monitoring Protocol: A Review and Implementation for Scientific Integrity. U.S. Fish and Wildlife Service. Grosse Ile, Michigan.

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Overview

The Detroit River Hawk Watch is a joint effort between the Detroit River International Wildlife Refuge and the International Wildlife Refuge Alliance. The program fulfills the Refuge's obligation to scientifically monitor wildlife populations and promote appreciation of the region's wildlife resources. The Detroit River Hawk Watch Monitoring Protocol: A Review and Implementation for Scientific Integrity is to be used by field workers to collect data on fall raptor migration at the mouth of the Detroit River from which reliable trend analyses and population indices can be derived. The protocol matches recommendations provided by the Hawk Migration Association of North America and other resources to increase the scientific merit of the data.

1. INTRODUCTION

1.1. Background and Purpose of the Detroit River Hawk Watch

The Detroit River Hawk Watch (DRHW) is a joint venture between the Detroit River International Wildlife Refuge, managed by the U.S. Fish and Wildlife Service, and the Refuge's non-profit Friends' Group, The International Wildlife Refuge Alliance (IWRA). There are three objectives of DRHW:

1) Monitoring – collect high quality annual fall raptor migration data at the mouth of the Detroit River from which scientifically defensible trend analyses and population indices can be formulated;

2) Appropriately disseminate the data collected to the public and scientific community; and

3) Interpret the count and educate the public on the migration to promote awareness of the region's wildlife resources.

These three objectives fulfill one purpose, four goals, and one specific objective for the Refuge as outlined in the Refuge's Comprehensive Conservation Plan (USFWS 2005):

- **Purpose 3** (page 6): "To facilitate partnerships among the United States Fish and Wildlife Service, Canadian national and provincial authorities, State and local governments, local communities in the United States and in Canada, conservation organizations, and other non-Federal entities to promote public awareness of the resources of the Detroit River";
- **Goal 2** (page 50): "The Refuge will facilitate and promote hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation as wildlife-dependent uses";
- **Goal 3** (page 52): "Visitors and local citizens demonstrate a strong conservation ethic that supports the Refuge and broad-based environmental awareness; and
- **Goal 5** (page 54): "People living or working within the Refuge watersheds will understand and appreciate the importance and ecological value of the Detroit River and Western Lake Erie, and their contributing watersheds, to fish and wildlife and to human quality of life."
- **Goal 7** (page 55) "Fish and wildlife communities are healthy, diverse, and self-sustaining"; and
- **Objective 7.2** (page 55)**:** Establish partnerships to monitor populations of trust resources.

Responsibilities for the DRHW are described in the Detroit River Hawk Watch Advisory Committee Terms of Reference (see Appendix 1). This document states that the Refuge will provide a biological technician or biologist to manage all data, oversee the scientific integrity of the watch and complete all reports, publications, including those on-line. An IWRA board or committee member will serve to fulfill the obligations of IWRA. These are the following:

- Manage all financial aspects of the hawk watch program;
- Submit and manage grants;
- Perform outreach events, such as the annual Hawk Fest at Lake Erie Metropark; and
- Maintain DRHW website.

Refuge personnel and IWRA will work closely with the Detroit River Hawk Watch Advisory Committee through regular meetings, which is a volunteer panel with expertise in fulfilling the three objectives of the DRHW. The Committee will advise Refuge personnel on maintaining the scientific obligations and scientific relevancy of the count, and likewise advise IWRA on aspects relating to outreach. This protocol will be reviewed each year to ensure it is meeting the program's three objectives and will be presented each year at the end of August to all counters and outreach volunteers.

1.2. Purpose and rationale of the monitoring program.

DRHW will provide three types of information: (1) An estimate/sample of local passage of migratory raptors (2) An estimate of demographic parameters (e.g., information on population structure provided by data on species' sex and age classes); and (3) A measure of the environmental variables believed to affect the first two estimates (Hutchinson 1978; Ralph et al. 1993).

The Hawk Migration Association of North American (HMANA) has provided three options for a standard data collection protocol for raptor migration monitoring since its formation in 1975. In this document, DRHW has implemented components of the protocols as closely as possible in an effort to maintain the highest quality migration monitoring data that can be used in scientific analyses.

1.3. Objectives of this protocol.

This protocol will serve as the specific data collection technique for raptor monitoring at the DRHW and meets three objectives: (1) Present a review of the rationale of why these data should be collected and (2) Provide specific procedures from which all data associated with the DRHW are collected.

1.4. Organization of this protocol.

This document follows the same format and structure as the current set of HMANA (2006a) standards, termed "Protocol 1" (see Appendix 2): it starts with information on count site location and when data are collected, target species and parameters that are recordable under field conditions, and instructions for weather and flight recording conditions. This protocol uses the metric system at all times. A Seasonal Metadata Form (Appendix 3) records count site specifics, species coverage, and data collection instructions for each year at DRHW.

2. MONITORING SITE SPECIFICS

2.1. Location.

A fixed count site location has one specific point from which migration counts are conducted throughout the season. Because DRHW is a scientific monitoring program, counting from a single point at all times is necessary. No birds recorded are as informative as many birds recorded. DRHW is located within Lake Erie Metropark (LEMP) in Wayne County, Michigan. Counting takes place at a picnic area just south of the Metropark boat launch (N 42.0792, W 83.1937). The count site is flat at approximately 575 ft. above sea level. Southeastern Michigan is in the ancient Maumee lake-plain. The view is of the mouth of the Detroit River in view of southwestern Ontario.

The flight path of raptors over the lower Detroit River is strongly influenced by wind direction, and therefore, a secondary site could be staffed when the minimum of one primary counter and one assistant is met at LEMP. The secondary site is located at the Pointe Mouillee State Game Area Headquarters observation deck (N 42.0379, W 83.1982). The primary counter must always stay at LEMP. At any time, volunteers who are not the designated assistant may take an extra datasheet from the primary counter at LEMP and conduct a count at Pointe Mouillee. All data from Pointe Mouillee collected on DRHW datasheets should be submitted in a timely fashion to the primary counter at the end of the day. The data are then submitted separately from LEMP in HawkCount.org. Counters at Pointe Mouillee must employ the specific procedures described in this protocol to the maximum extent possible in order to submit the data for inclusion in HawkCount.org. It must be recognized that intermittent staffing at Pointe Mouillee will exclude these data from population index analysis, but nonetheless, this record is of value in fully understanding migration through the Detroit River corridor in a given year.

Photographs should be taken of the site each year to document the landscape features of the count site and to provide a historical record of change in the landscape.

2.2. Seasons and dates of operation.

The length of the field season has a strong influence in its power to estimate trends. Lewis and Gould (2000) estimate that counts conducted over periods of 30 or 60 days have a lower statistical power than counts conducted over a period of 90 days. The ability of shorter field seasons to estimate population trends decreases because the coefficient of variation of annual counts increases in samples composed of fewer consecutive days of counts. Counts conducted less than or equal to a period of 90 days can attain comparable statistical power than counts conducted over 90 consecutive days.

The seasonal timing of migrant raptor species has skewed distributions with long, heavy tails (i.e., a species migrates through in low numbers for a long time, then increases in numbers, reaches a peak, and decreases to low numbers for a long time).

The official daily count at DRHW begins on 1 September and ends on 30 November each year to capture at least 95% of the fall migration window for each regularly occurring

raptor species at the mouth of the Detroit River (Figure 1).

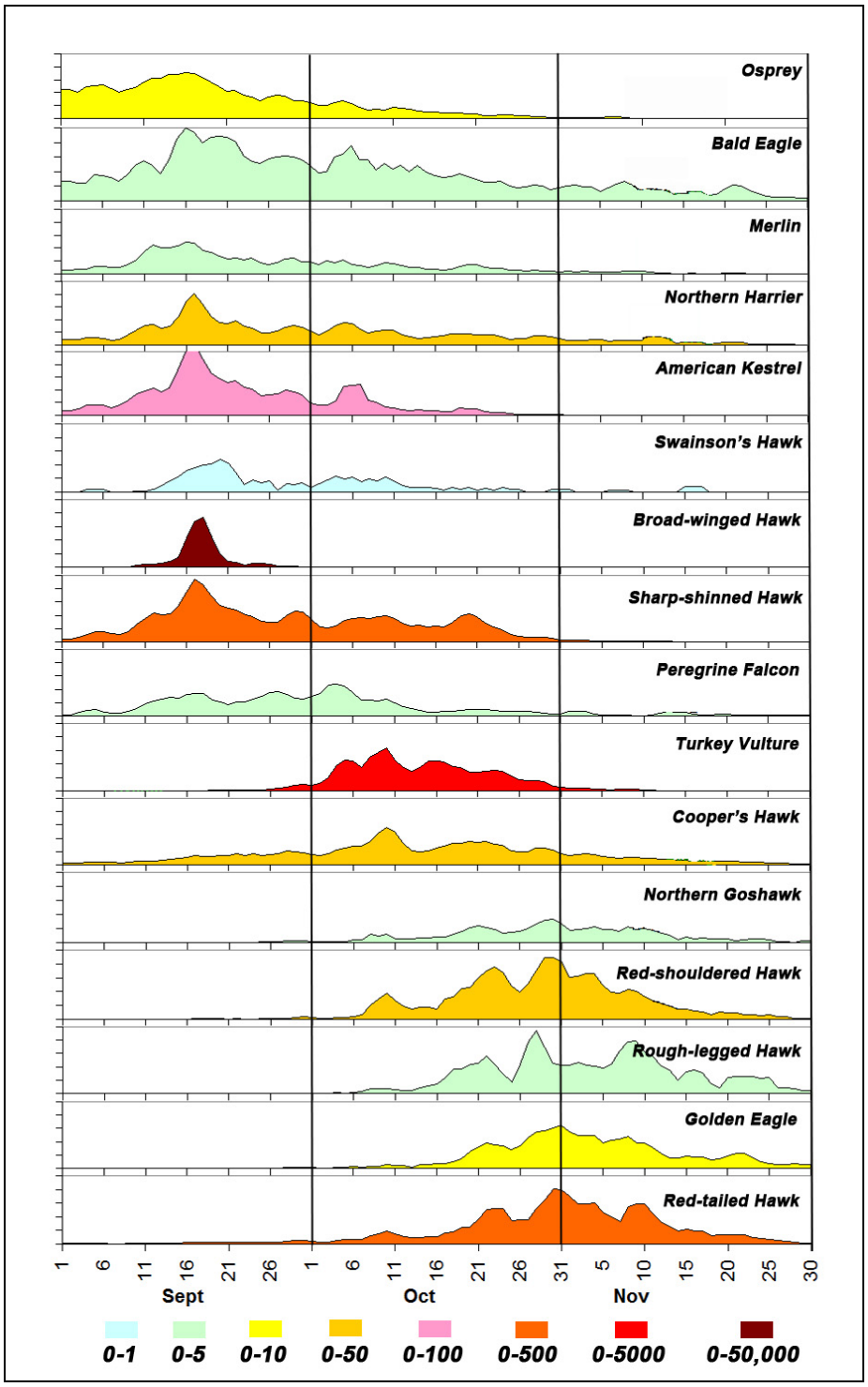

Figure 1. *Seasonal distributions of raptors through the Detroit River Hawk Watch site between 1 September and 30 November. Results based on 3-day running average of count data collected between 1991 – 2008. Figure created by Jerry Jourdan.*

2.3. Daily times of operation.

Coastal sites tend to have an earlier period of migration activity than inland sites (Kerlinger 1989) and appropriate coverage of the 95% window of daily migration should be planned to capture this particularity.

Daily observations provide the optimal coverage because data collected over non-consecutive days (e.g. weekend counts), or counts conducted over a structured sampling calendar (e.g. two days on, one day off), have not been tested.

DRHW will provide hourly records of raptor observations each day between 07:00 and 15:00 Hrs (Eastern Standard Time) from 1 September to the point in October when the official sunrise is one hour later due to the decline in day length. This is typically about 25 October and the exact date is available through the National Weather Service. After this date, the count will begin at 08:00 Hrs (EST) and end at 15:00 Hrs (EST) until November 5 when the count can be started no later than 09:00 Hrs (EST). The change from Eastern Daylight Savings time in early November has no impact on the time of the count since all times are recorded in Eastern Standard Time. Data collected beyond the standard hours of coverage can be included on the datasheet and Hawkcount.org if all aspects of the protocol were followed.

Counters should conduct the count each day despite weather conditions, unless lightning or thunder is near. The data generated on days with adverse weather is as valuable as data collected on days with good weather. If dangerous weather is occurring, counters and other volunteers should seek immediate shelter in the Marshlands Museum. Counters and other volunteers should be familiar with other nearby coffee shops and other buildings where shelter can be obtained if the Museum is not opened. If persistent rain or snow is occurring, counters should contact Refuge personnel to discuss the rare event of a cancellation due to weather. Fog typically burns off early in the day. However, fog also can occur at any time and should not be a reason for cancellation of the count.

In the rare event of a cancellation, observers must clearly document the reason why a count has been interrupted or when a count day was missed on the data sheet for that day and it should be submitted appropriately in Hawkcount.org.

2.4. General description of the flight.

Hawks constrain their migration to routes defined by favorable flight conditions. Site descriptions must select between (1) Diversion Line (a geographic or topographic feature that causes migrants to alter their course so as to avoid crossing the line, making them appear to follow it (e.g., a shoreline followed by hawks who have an aversion to fly over a large water body); or (2) Leading Line (a geographic or topographic feature that has properties that induce migrants to change their direction of travel so as to follow them (e.g., a mountain ridge with updrafts along its crest; Mueller and Berger 1967).

Migrant raptors at DRHW follow a diversion line (the north shore of Lake Erie),

flying from east to west as they seek to minimize the necessary water crossing distance at the mouth of the Detroit River at the northwestern limit of Lake Erie. Depending on wind and thermal conditions, birds may be observed across a 180-degree arc as they navigate their optimal water crossing strategy. It is recognized that even though raptors are greatly concentrated by the diversion line of the northern shore of Lake Erie, some raptors may cross out-of-sight to the south (often on very strong northerly winds) and others will pass to the north (on more southerly and westerly winds).

Birds often utilize thermals that form over Canada or above the islands in the Detroit River to gain altitude. Raptors gain altitude on these thermals and then stream across the water, passing east to west as they exit thermals and lose altitude as they approach DRHW and the northwest-southeast count line. Similarly, migrants may first be spotted in thermals that have formed over sites north along the U.S. side of the river from where they stream south and westward toward DRHW. Falcons and accipiters, which often do not use thermals, may be spotted anywhere across the observer view following the river and lake - shore east of the watch site.

3. SPECIES COVERAGE

3.1. Species covered.

Each site must clearly define the species focus of their observations. There are codes for species, sex, and age classes, color morphs, and subspecies in Table 1. Observers must be as accurate as possible with the identification of migrants, but also to acknowledge that it is impossible to identify, sex, and age, every single migrant. The percentage of unidentified migrants from sites ranges around 1-2%. The DRHW observers will count all diurnal migrating raptors, including vultures. The following species are recorded next to their two-letter code on the data sheet.

TV: turkey vulture (*Cathartes aura*)
OS: osprey (*Pandion haliaetus*)
BE: bald eagle (*Haliaeetus leucocephalis*)
NH: northern harrier (*Circus cyaneus*)
SS: sharp-shinned hawk (*Accipiter striatus*)
CH: Cooper's hawk (*Accipiter cooperii*)
NG: northern goshawk (*Accipiter gentilis*)
RS: red-shouldered hawk (*Buteo lineatus*)
BW: broad-winged hawk (*Buteo platypterus*)
SW: Swainson's hawk (*Buteo swainsoni*)
RT: red-tailed hawk (*Buteo jamaicensis*)
RL: rough-legged hawk (*Buteo lagopus*)
GE: golden eagle (*Aquila chrysaetos*)
AK: American kestrel (*Falco sparverius*)
ML: merlin (*Falco columbarius*)
PG: peregrine falcon (*Falco peregrinus*)
UNK: unknown raptor species

In the rare event that other raptor species not listed above are observed, these observations will be documented in the notes on the datasheet and acknowledged in the reports in HawkCount.org.

3.1.1. Non-raptor migration

DRHW observers are encouraged to estimate the number of other substantial migrations when it does not distract from the scanning and counting procedures described below. This information should be noted on the field datasheet and described in complete sentences in the appropriate section of HawkCount.org. Additionally, a general description of these observations should be noted as part of the daily record, as most visitors appreciate this lateral information. These observations, including species that are only occasionally seen, should be submitted separately in a professionally prepared report to the Fall Compiler of the Michigan Bird Survey that is published in *Michigan Birds and Natural History* after the USFWS staff have reviewed it.

3.2. Migrants vs. non-migrant raptors

When migrating, raptors commonly remain in stopover areas for several days and move back and forth past the observation point. Each site must clearly determine what constitutes a migrant (e.g., "a hawk that flies past the observation point and does not come back") and observers must follow clearly written rules to make decisions regarding classifying an individual as a migrant or a "local" bird. At DRHW, a "migrant" is defined as the following:

> **A bird that passes the count site and crossed the count line (defined below) from the east and flying northwest, west, and southwest and does not reverse its course.**

The "count line" that a bird must cross to be considered a migrant is defined as:

> **An approximate projection of the sea wall directly in front of the observer from horizon to horizon, which is a line running northwest to southeast.**

Birds are not counted as migrants if they are in view for extended periods of time and/or are observed actively hunting. Instead, these birds should be considered "local" birds and not documented in the formal count. Identifying an individual bird by sex or age, when possible, may assist with the migrant versus non-migrant/local determination.

4. DATA RECORDING AND DATA STORAGE

4.1. Equipment and materials in use.

The evolution of optical equipment, field guides, and other field equipment has changed

the way migration counts are conducted in recent years, and has increased the number of birds detected and correctly identified. For this reason, there should be accurate notes on optical equipment, data recording equipment, and other hand instruments. These may include equipment used for collection of weather data and estimations of flight variables with range-finders and ornithodolite-type equipment (Pennycuick 1982) and electronic weather station information.

Each observer at DRHW will use a functioning 8-10X binocular. A spotting scope or binocular, not exceeding 60X, should be used to confirm the identification of a bird difficult to identify. Observers will use hand-held tally counters and will record weather data with a Kestrel 3000 (Nielsen Kellerman, Boothwyn, PA) or equivalent hand-held weather meter.

Counters at DRHW should keep accurate notes on optical and data recording equipment used at the site on a given day in the meta datasheet form for each year. These notes should also include a list of personal care equipment and materials present at the site each day, such as chairs, unbrellas, sunglasses, and other items that may reduce fatigue.

4.2. Weather variables and flight recording conditions.

Weather and flight-recording conditions are perhaps the most central variables required for data analysis. Variables recorded at monitoring sites include wind speed (Table 2), precipitation (Table 3), wind direction, cloud cover, humidity, temperature, and barometric pressure (see details in Appendix 2 and Tables 2-4).

The following variables are to be recorded at DRHW:

1. Wind speed (km/hour) – Table 2
2. Wind direction (NW, NNW, N, NNE, NE, ENE, E, ESE, SE, SSE, S, SW, WSW, W, WNW, Calm, Variable) – Table 2
3. Visibility (kilometers), - Appendix 4
4. Cloud cover (percent cover), - Appendix 2
5. Temperature (Celsius), - Appendix 2
6. Precipitation (0, fog, drizzle, rain, sleet-rain, snow) – Table 3
7. Percent Humidity

Cloud cover should record the percentage of sky with background cloud cover. Temperatures should be taken away from direct sunlight. The Kestrel 3000 device should remain out of the sun and turned-on for at least three minutes prior to recording the temperature. Wind direction and speed should be taken with the Kestrel 3000 pointed directly into the wind with the *maximum wind recorded after 15 seconds* and after the termination of a unusually high random gust that would be non-representative of current conditions. Visibility will describe the distance an observer can clearly see without obstruction from fog, rain, snow, or haziness (see Appendix 4). Barometric Pressure should be taken hourly from the Grosse Ile, MI almanac provided by Weather Underground at (http://www.wunderground.com/history/

airport/KONZ/2011/6/17/DailyHistory.html?req_city=NA&req_state=NA&req_statename=NA). The first available recording after the start of the count should be used for that hour's barometric pressure reading.

4.3. Identification, detection, and estimation.

Scanning of the sky for migrants should be actively done with both the naked eye and 8-10x binoculars. Spotting scopes should not be used to find migrants during scanning. Spotting scopes may, however, be used after a migrant is located using the above method, but only for identification of species, age, and sex.

Observers must record the identification aids available to them at the site each day (books such as Dunne et al. 1988, Wheeler and Clark 2003, and Liguori 2005). DRHW will have the Sibley Guide to Birds on site at all times. Any other identification aids (brought by the official counters or observers) should be recorded as they are available.

HMANA protocols two and three require that data on sex and age classes, color morphs, and subspecies information are collected whenever it is possible under field conditions. Although it is often not possible to determine all the features requested for each record, especially during high volume flight, this information, even if only determined in a low proportion of the records, may be of help in determining population parameters of importance for explaining population trends (e.g., the high proportion of juveniles versus adults in migration counts is an indicator of breeding success). As such, the counter and crew at DRHW should make his/her best attempt to collect the above information for each migrant that is part of the official count

A clear description of the estimation methods is also important for locations and species that migrate in gregarious flocks (Pennycuick 1998). The dynamics of these flights involve migrants entering rising thermals from the bottom and gaining altitude as they circle around the center of the thermal to take advantage of the lifting warm air to gain height. Once at a high altitude, a bird exits the column in their desired direction and starts the process again when they have lost height.

It is not possible to conduct a good estimation of the number of raptors when they are circling, therefore, migrants should be counted when streaming between thermals with the use of hand-held tally counters. Raptors should be directly counted (1, 2, 3, 4…) when possible, or estimated (in groups of 5, 10, 50…) if necessary. Observers should be aware that the higher the multiple used in these estimates, the higher the error estimating the right number of birds. Lower multiples should be chosen whenever possible. The primary counter should note when the group estimate is used and the size of the unit on the datasheet.

The core tenets for counters and data analyzers is that (1) It is more important to collect data consistently than recording more birds per site; (2) It is better to err on the side of being conservative than inaccurate; and (3) Identifications and estimations should also be

conservative since a perfect record of identifications of species, sex and age classes, and other data per record is not possible under field conditions.

All official counters at DRHW should understand that, for a variety of reasons, even the most skilled raptor counters will not be able to confidently identify all the migrants they observe in a season. In fact, the percentage of unidentified migrants counted at other sites ranges around 1-2% and of their yearly total. Counters at DRHW should understand and be reminded that, if a raptor is unidentifiable from the counter's vantage point, guessing at the species (or age or sex) is not acceptable. There is no shame in, and it is even preferred that, an observer document an unidentifiable raptor as "UNK – Unknown" in the record instead of guessing.

DRHW SCANNING PROCEDURE:

Observers will scan the sky with their naked eye and regularly scan the entire horizon once every few minutes with an 8-10X binocular. It is important for observers to consistently check the other areas of the sky from where most birds may be migrating because shifts in the migration are common and flight paths can be variable. Binoculars or spotting scopes exceeding 10X cannot be used to scan the horizon, but can be used to identify a bird already spotted. In scanning, the sky and panorama can be divided into three sectors (Figure 2):

NW-N – Marsh Creek to DTE Energy Trenton Power Plant stacks
N-SE – DTE Energy Trenton Power Plant stacks to three trees at the tip of the Gibraltar shore
SE – three trees/Celeron Island to end of boat launch seawall (mostly the Canadian shore)

Figure 2*. A panoramic view showing three sectors of the Detroit River and Lake Erie from the Detroit River Hawk Watch. Photo credit: Jerry Jourdan.*

DRHW COUNTING PROCEDURE:

Only birds determined to be migrating are counted. A specific stream of birds first spotted with the naked eye or binoculars can have their identification confirmed using a spotting scope not exceeding 60X. Counting should be performed using binoculars (i.e., if birds are too distant to accurately count with binoculars, they should not be counted). This will cause many birds to go un-counted, but these limitations will make data collection more consistent across

years and still maintain a sample of the abundance at the time.

Kettles should be counted with binoculars when birds are in rows or lines, not when they are aggregated in a mass. Patience is required to wait for this to occur.

Each bird that passes the count site from the east and flying northwest, west, and southwest should be counted. Specifically, the count line that a bird must cross is approximately a projection of the sea wall directly in front of the observer from horizon to horizon, which is a line running northwest to southeast.

Additional data should be collected when the following species are observed and as the situation permits. Collecting these data is a secondary objective of the counting crew and should be done for individuals of the following species without impacting the consistency of detection, identification, and counting of all raptors (Table 1). See Appendix 6 to view the data sheet in which this information is recorded.

Table 1. *Age and color morph data desired for raptors at Detroit River Hawk Watch.*

Species	**Age (Primary)**	**Color Morph (Secondary)**
Bald Eagle	Adult versus sub-adult	
Northern Harrier	adult versus juvenile	
Sharp-shinned Hawk	adult versus juvenile	
Cooper's Hawk	adult versus juvenile	
Northern Goshawk	adult versus juvenile	
Red-shouldered Hawk	adult versus juvenile	
Broad-winged Hawk	adult versus juvenile	
Swainson's Hawk	adult versus juvenile	
Red-tailed Hawk	adult versus juvenile	
Rough-legged Hawk		light versus dark
Golden Eagle	adult, sub-adult, juvenile	

4.4. Personnel and Visitors

Two to three person teams will be assigned to count for each day. In addition, at least one individual should be available on weekends from 11AM to 3PM to welcome, interact, and teach visitors. At minimum, there will always be one primary counter, and one assistant counter on site for the standard hours of flight (see section 2.3.). The individual/s serving as primary counter/s should vary regularly (i.e., a contractor should not be the primary counter each day). The names and roles of each member of the counting crew will be displayed each day on a dry erase board. The responsibilities of each individual on the counting crew during the count are as follows:

Primary counter:

1. Primary scanner of the sky. Responsible for determining and verifying the total

number, age, sex, and color morph of migrating birds of each species for each hour of the counting day.

2. The 'final say' in identification of a raptor. However, there must be a collaborative approach between the primary and assistant counter/s in the identification of raptors. *However, the primary counter should remember… there is an unidentified raptor category on the datasheet. When the primary counter is unsure of an identification (an unavoidable situation at any site), he/she should not hesitate to use this column.*

Assistant counter(s):

1. Responsible for tallying migrants and recording migrant numbers and other data on the datasheet.
2. Responsible for collecting all necessary weather data at the appropriate intervals during the counting day.
3. Responsible, when not tallying or recording, for scanning the sky to supplement the efforts of the primary counter.
4. Responsible for providing a "second opinion" or advice on a puzzling or distant identification (when requested by the primary counter).
5. Responsible for scanning while the primary counter confirms the identity of a bird. This is so the primary counter can put his/her attention to the bird to obtain more information (i.e. sex, morph, migration status, etc.)
6. Responsible for use of reference materials – getting identification help from the on-site reference aids (when requested by the primary counter).
7. Responsible for engaging visitors, if appropriate and if time permits, in order to answer their questions or provide an update on the count. Also, some visitors may not be aware of the methods and rules outlined in this protocol. This person should also be responsible for ensuring every visitor is aware of the protocol and deterring visitors from compromising the integrity of the count (see discussion below on this) *Note: while making visitors at feel welcome at the count site is important, it should never come at the expense of the accuracy of the count. All members of the counting crew and all volunteers should be aware that the count comes first, and visitors second.*

If a third person is assigned to the crew on a given day (or part of a day), this third individual will also be considered an assistant counter for that day. With a three-person counting crew, there are two ways to split the above responsibilities, depending on the flight volume that day:

Three-person crew scenario #1: When flight volume is such that only one primary counter is sufficient to count and identify all passing migrants. Under this scenario, there is one primary counter and two assistant counters. The two assistant counters split the six duties of the assistant counter (above)

Three-person crew scenario #2: When flight volume is very high such that the one primary counter cannot reasonably keep up with counting and identifying all passing migrants. Under this scenario (at the request of the primary counter), one of the assistant counters may effectively become a second primary counter. The primary counter will give the secondary counter a distinct portion of the sky in which he/she will count and identify raptors, communicating the count data to the other assistant counter. Under this scenario, the other

(third) assistant counter will assume responsibility for all his/her assigned duties listed above.

Outreach Personnel:

1. Welcome each new visitor, address questions, offer help in identification, and update visitors on the count.
2. Make each visitor aware that information on the count and daily/seasonal totals can be obtained at www.drhawkwatch.org.
3. Update dry-erase board with the daily total for each raptor species about every hour by borrowing the datasheet.

Disturbance at the site as a consequence of visitors, usually from visitor's outside conversation, should also be recorded using the following code: 0=none, 1=low, 2=moderate, and 3=high. Clear documentation of these things can help to adjust model estimates, if necessary, at the time of data analysis.

At DRHW, especially on favorable days, there can be a large number of visiting observers that wish to actively participate in the count. Visitor participation is encouraged during the count; however, members of the assigned counting crew (outlined above) should ensure the rules established in this protocol are being followed by all visitors. If any visitor is not willing to follow the rules and is compromising the integrity of this method, they should be politely asked to watch migrants from a vantage point out of sight and ear-shot of the assigned counting crew. If they refuse and insist on remaining at the count site, the assigned counting crew should make every attempt to maintain the integrity of the count by ignoring any information that might be coming from offending visitors.

All DRHW visitors are encouraged to sign a rite-in-the-rain notebook available at the main picnic table indicating their time of arrival and departure each time they visit the count site. Every visitor must be welcomed to the count by DRHW contractors and volunteers and told about the opportunity to sign-in. Counters should minimize distracting conversations (but not eliminate communication) and utilize every opportunity to engage any dedicated outreach personnel to answer questions. A dry-erase board is set up daily, which will show the DRHW website address (www.drhawkwatch.org) and the daily raptor total updated each hour.

4.5. Data collection and management.

Data collected in the field should be transferred to a safe location at the end of the work day. Many count sites collect data in field notebooks and data is then transferred to data forms or electronic spreadsheets or other databases. Data transfer should be done carefully and proofread, preferably by a different person than the one doing data entry.

The DRHW primary counter shall complete the field datasheet and enter all the hourly data into HawkCount.org on the same day that data are collected. The primary counter or their designee shall provide mid-day Twitter account reports of mid-day developments. The primary counter should provide quality summaries on HawkCount.org, using full sentences, regarding

the general weather, raptor and non-raptor migration for that day, and provide a prediction for the type of migration on the next day. All original field datasheets from DRHW are obtained by Refuge personnel from the contract counter or volunteers by the end of the season and placed in organized binders at the Large Lakes Research Station on Grosse Ile, Michigan. As of the time of this writing, Greg Norwood, SCEP Biologist with the U.S. Fish and Wildlife Service, maintains these records and all passwords, reports, and publications in the Grosse Ile office and can be transferred to future Refuge personnel when necessary. The contract counter or volunteers should work with USFWS staff to prepare a high quality final report of the season, submit a version to *Hawk Migration Studies*, and submit a report to the Fall compiler of the Michigan Bird Survey published in *Michigan Birds and Natural History*.

4.6. Seasonal metadata.

Filling a Seasonal Metadata Form at the end of a field season is essential to determine when changes in the data collection protocol have occurred. Information in this form is very important in later interpretation of data (Appendix 2).

5. SOURCES OF INFORMATION AND LITERATURE CITED

This protocol was generated from existing data collection protocols of HMANA, Hawk Mountain, HawkWatch International, Illinois Beach State Park, Holiday Beach Migration Observatory, Hawk Ridge, Pronatura Veracruz, Hawk Cliff, and Braddock Bay Bird Observatory. Jeff Smith, Laurie Goodrich, Steve Hoffman, and Sue Ricciardi provided comments on an earlier manuscript. Concepts of leading and diversion lines were obtained from an unpublished manuscript by Keith Bildstein and Chris Farmer.

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APPENDIX 1

Detroit River Hawk Watch
Terms of Reference

The U.S. Fish and Wildlife Service (USFWS) holds primary responsibility for the Detroit River Hawk Watch (DRHW). USFWS works collaboratively with the International Wildlife Refuge Alliance (IWRA), which holds DRHW responsibilities outlined in these terms of reference, and are both advised by the DRHW Advisory Committee (Committee). The Committee serves as an expert advisory panel on the scientific and technical aspects of DRHW and assists with review and preparation of all publications through regular meetings.

USFWS personnel will primarily be responsible for the following:

- Maintain count protocol;
- Manage data, reports, and publications produced from the work of the Detroit River Hawk Watch;
- Provide information to be given to the public and scientific community;
- Review data used with permission or conclusions stemming from the data from all other organizations, including IWRA;
- Work collaboratively and on a regular basis with an Advisory Committee that reports to both USFWS and IWRA; and
- Share responsibility of annual Hawk Fest with IWRA, who plays a lead role in Hawk Fest.

The Committee is established under both USFWS and IWRA, and reports to both through regularly scheduled meetings. The Committee is responsible for the following:

- Advise USFWS on Detroit River Hawk Watch (e.g., count protocol, data management, reports, publications, website and brochure content);
- Actively pursue potential research projects using existing data, with special emphasis on collaborative work, especially with Canadian partners (i.e, build International component of DRHW);
- Work collaboratively with the USFWS, IWRA, and staff of Huron Clinton Metropolitan Authority to undertake outreach, programming, interpretation, and other necessary functions for the annual Hawk Fest; suggest programming and important themes for the public;
- Review/assist in preparing grants (e.g., Challenge Cost Share Grants from USFWS, foundation grants, Friends Group Grants, etc.) with USFWS and IWRA to support an annual counter, publication costs, and other elements of Detroit River Hawk Watch and Hawk Fest; and
- Recommend contractor/committed skilled volunteers on an annual basis for count or specific data analysis projects.

IWRA will have at least one Board member on the Advisory Committee and will help recruit and train Advisory Committee members. IWRA will play a lead role in delivering Hawk Fest, including staffing a booth to share information and offer shirts and other merchandise for donations, deliver programming (with input from USFWS), and promote the Refuge and Detroit River Hawk Watch.

IWRA will primarily be responsible for the following:

- Maintain DRHW website with count journal;
- Lead responsibilities for Hawk Fest and share duties with USFWS;
- Conduct public outreach regarding all components of the Detroit River Hawk Watch, including data, reports, and publications in concert with information provided by USFWS staff (who receives technical advice from Committee) – e.g., brochures, maintenance of informational sign at count site, maintenance and replacement of dry-erase board and accessories at count site, work collaboratively with Refuge Park Ranger or Refuge Visitor Use Specialist on all outreach activities, delivering public programs (identification workshops, photography workshops, raptor migration workshops, migratory raptor conservation programs, photo contests, etc.), recruiting and coordinating volunteers (beyond official spotters), some weekend presence from 1 September to 30 November (e.g., the IWRA Board may wish to have merchandise available);
- Conduct administrative duties for any non-Federal contractors

APPENDIX 2

WEATHER AND OBSERVATION CODES AND TABLES

Notes: The following tables (Appendix 2 and Tables 1-4) describe standards for data collection. Protocol 1 (HMANA 2006a) is the minimum, most basic one available, and grows in complexity with increasing level number, e.g. Protocol 3 is more specific than 1 and 2. One of the main changes in Protocol 1, which uses categorical data for different variables, are changes in the way data are recorded and replaces preset categories for longitudinal values. This protocol encourages the use of Metric System units. A site may use elements of different protocol levels, which should be documented by collecting seasonal metadata at the end of each field season (Appendix 2).

Variable	Protocol 1	Protocol 2	Protocol 3	Notes
Wind speed	Use category codes in Table 2	Data collected with standard hand instruments and recorded in precise units, not categories	Data collected with high precision instruments or electronic weather station	Data recorded at ground level unless otherwise noticed. Wind speed is recorded in km/h - kilometers per hour. To transform miles into km, multiply km x 1.609
Wind direction	Enter compass direction from which the wind is coming (16 possible categories) i.e. N, NNE, SE, etc. if variable, enter VAR. Data collected from site exposed to wind, with limited local interference	Use of a compass and wind vane to determine wind direction in degrees. Data collected from site exposed to wind, with limited local interference	Data collected with high precision instruments or electronic weather station	Use of a wind vane or marker to determine wind direction
Temperature	Temperature recorded with hand thermometer placed in shaded area of monitoring site	Temperature recorded with hand thermometer placed in shaded area of monitoring site	Data collected with high precision instruments or electronic weather station	Temperature is recorded in ^{o}C degrees centigrades. To covert ^{o}F to ^{o}C, substract 32 to ^{o}F and divide by 1.8
Humidity	Record the percent relative humidity with hydrometer	Record the percent relative humidity with hydrometer	Data collected with high precision instruments or electronic weather station	
Barometric pressure	Record barometric pressure with barometer in inches of Mercury (inHg)	Record barometric pressure with barometer in inches of Mercury (inHg)	Data collected with high precision instruments or electronic weather station	Metric system recordings in hPa or mbar (hectopascal, identical to millibar). To transform inHg to mbar, multiply inHg x 33.86
Cloud cover	Record percentage of sky with background cloud cover	Record percentage of sky with background cloud cover	Record percentage of sky with background cloud cover	
Cloud type	Not included	Four categories	??	

Visibility	Judge from your longest view and enter distance in km	Estimate clear visibility to the longest view to know landscape features with distances calculated from a topographic map	Estimate clear visibility to the longest view to know landscape features with distances calculated from a topographic map	To convert miles to km multiply miles x 1.1609

Variable	Protocol 1	Protocol 2	Protocol 3	Notes
Precipitation	Use category codes in Table 3	Use category codes in Table 3	Data collected with high precision instruments or electronic weather station. Detailed notes on distribution of precipitation per hour	To convert inches to mm, multiply in x 25.4
Flight direction	Enter compass direction migrants are heading (16 possible categories) S, SW, SSW, etc.	Enter compass direction migrants are heading (16 possible categories) S, SW, SSW, etc.	Enter compass direction migrants are heading in degrees	
Height of flight	Use category codes in Table 4	Use category codes in Table 4	Calculated with instruments such as radar, thermal imager, range finder, ornitholodolite, etc.	Standards in protocols 1 and 2 refer to the height of flight of “most” migrants for the hour. Standards in protocol 3 refer to data from individual birds and it is only expected from specific research projects
Observers	Number of trained observers contributing to the count for the hour noted	Coverage by standard number of trained official observers, either professional or volunteer	Coverage by standard number of official trained professional of volunteer observers	
Duration of observation	Specify time in minutes	Specify time in minutes	Specify time in minutes	

Table 1. Species names and sex, age, and color morph codes

Notes: Protocol 1 does not require identification of sex, age, and color morph classes. Identifiable sex and age classes fide Wheeler and Clark (2003) and other sources. The term Juvenile refers to birds in prebasic/preformative molts and Adult to birds in basic plumages (fide Howell et al. 2003, Pyle 2006). Two-letter species codes are those in use in Protocol 1 (HMANA 2006a).

The list is arranged in phylogenetic order according to AOU (1998) and subsequent supplements. New World Vultures (Black and Turkey Vultures) were placed within the Ciconiiformes in 1998 (AOU 1998), but still are considered in this table to allow consistence with earlier protocol.

* Denotes codes used in this document for the first time, not in the original source of Alpha Codes (Pyle and DeSante 2003).

** Denotes many species that have up to five 'juvenile' successive forms (prebasic/ preformative molt stages) that can be distinguished. The term "Basic" as used by Wheeler and Clark (2003) is used in this protocol as Prebasic/Preformative (Pyle 2006).

English name	Scientific Name	HMANA Code	Alpha Code	Protocols 2 and 3
Black Vulture	*Coragyps atratus*	BV	BLVU	
Turkey Vulture	*Cathartes aura*	TV	TUVU	U - unknown J - juvenile A - adult
Osprey	*Pandion haliaetus*	OS	OSPR	U - unknown J – juvenile A – adult
Swallow-tailed Kite	*Elanoides forficatus*	SK	STKI	U - unknown J – juvenile A - adult
White-tailed Kite	*Elanus leucurus*	WK	WTKI	U - unknown J – juvenile A - adult
Mississippi Kite	*Ictinia mississippiensis*	MK	MIKI	U - unknown J – juvenile A – adult Males and females can be distinguished in the field only under exceptional conditions
Plumbeous Kite	*Ictinia plumbea*	PK	PLKI	U - unknown J – juvenile A - adult
Hook-billed Kite	*Chondrohierax uncinatus*	HK	HBKI	U - unknown JL – juvenile light morph FL – adult female light morph ML – adult male JD – juvenile dark morph FD – adult female dark morph MD – adult male dark morph
Bald Eagle	*Haliaetus leucocephalus*	BE	BAEA	U - unknown J – juvenile PB I and II – "white-bellied" PB III – "Osprey-head" SA – subadult (either PB I, II, or III) A – adult**

English name	Scientific Name	HMANA Code	Alpha Code	Protocols 2 and 3
Northern Harrier	*Circus cyaneus*	NH	NOHA	U - unknown J – juvenile F – adult female Br – (brown) juvenile or female M – adult male
Sharp-shinned Hawk	*Accipiter striatus*	SS	SSHA	U - unknown J – juvenile A – adult
Cooper's Hawk	*Accipiter cooperii*	CH	COHA	U - unknown J – juvenile A – adult
Northern Goshawk	*Accipiter gentilis*	NG	NOGO	U - unknown J – juvenile A – adult
Gray Hawk	*Asturina nitida*	GH	GRHA	U - unknown J – juvenile A - adult
Common Black Hawk	*Buteogallus anthracinus*	CB	COBH	U - unknown J – juvenile A - adult
Harris's Hawk	*Parabuteo unicinctus*	HH	HASH	U - unknown J – juvenile A - adult
Red-shouldered Hawk	*Buteo lineatus*	RS	RSHA	U - unknown J – juvenile A - adult
Broad-winged Hawk	*Buteo platypterus*	BW	BWHA	U - unknown J – juvenile A – adult D – juvenile or adult dark morph
Short-tailed Hawk	*Buteo brachyurus*	ST	STHA	U - unknown JL – juvenile light morph AL – adult D – juvenile or adult dark morph
Swainson's Hawk	*Buteo swainsoni*	SW	SWHA	U - unknown J – juvenile A – adult JD –juvenile dark or intermediate/rusty morph AD – adult dark or intermediate/rusty morph ** Note that dark morphs may include rufous morphs and these two are lumped into a single category
White-tailed Hawk	*Buteo albicaudatus*	WT	WTHA	U - unknown J – juvenile A – adult**
Zone-tailed Hawk	*Buteo albonotatus*	ZT	ZTHA	U - unknown J – juvenile A – adult

English name	Scientific Name	HMANA Code	Alpha Code	Protocols 2 and 3
Red-tailed Hawk	*Buteo jamaicensis*	RT	RTHA	U - unknown J – juvenile A – adult JD –juvenile** intermediate/dark morph AD – adult** intermediate/dark morph ** Note that dark morphs may include rufous morphs and these two are lumped into a single category
Ferruginous Hawk	*Buteo regalis*	FH	FEHA	U – unknown JL – juvenile light morph AL – adult light morph JD – juvenile dark morph AD – adult dark morph
Rough-legged Hawk	*Buteo lagopus*	RL	RLHA	U – unknown JL – juvenile light morph AL – adult JD – juvenile dark morph AD – adult dark morph
Golden Eagle	*Aquila chrysaetos*	GE	GOEA	U – unknown J – juvenile S - subadult A – adult**
Crested Caracara	*Caracara cheriway*	CC	CRCA	U – unknown J – juvenile A – adult
American Kestrel	*Falco sparverius*	AK	AMKE	U – unknown F- female M – male
Merlin	*Falco columbarius*	ML	MERL	U – unknown BR – brown, female or juvenile M – male (subspecies: black [*F.c. suckleyi*], taiga [*F.c. columbarius*], and prairie [*F.c. richardsoni*])
Gyrfalcon	*Falco rusticolus*	GY	GYRF	U – unknown JW – juvenile white AW – adult white JG – juvenile gray AG – adult gray JD – juvenile dark morph AD – adult dark morph
Peregrine Falcon	*Falco peregrinus*	PG	PEFA	U – unknown J – juvenile A – adult
Prairie Falcon	*Falco mexicanus*	PR	PRFA	
Unidentified Vulture		UV	UNVU*	
Unidentified Accipiter		UA	UNAH	
Unidentified Small Accipiter	*Accipiter striatus* or *A. cooperii*	SA	UNSA*	
Unidentified Large Accipiter	*Accipiter cooperii* or *A. gentilis*	LA	UNLA*	

English name	Scientific Name	HMANA Code	Alpha Code	Protocols 2 and 3
Unidentified Buteo		UB	UNBH*	
Unidentified Eagle		UE	UNEA*	
Unidentified Falcon		UF	UNFA*	
Unidentified Raptor		UR	UNRA*	
Other Raptor		OO		

Table 2. Wind speed codes in Protocol 1

0 – less than 1 km/h (calm, smoke rises vertically)
1 – 1-5 km/h (smoke shift shows drift direction)
2 – 6-11 km/h (leaves rustle, wind felt on face)
3 – 12-19 km/h (leaves, small twigs in constant motion; light flag extended)
4 – 20-28 km/h (raises dust, leaves, loose paper; small branches in motion)
5 – 29-38 km/h
6 – 39-49 km/h (larger branches in motion; whistling heard in wires)
7 – 50-61 km/h (whole trees in motion; resistance felt walking against the wind)
8 – 62-74 km/h (twigs, small branches broken off trees, walking generally impeded)
9 – Greater than 75 km/h

Table 3. Precipitation codes in Protocol 1

0 – none
1 – Haze or fog
2 – Drizzle
3 – Rain
4 – Thunderstorm
5 – Snow
6 – Wind driven dust, sand, or snow

Table 4. Height of flight codes in Protocol 1

Notes: The estimation of height of flight is a function of the location of the monitoring site, in which case an accurate description of the monitoring site is important. For example, a site located in a mountain ridge may likely have birds above and below the horizontal. In this case, this protocol follows the recommendations of HawkWatch International's protocol – hawks below the horizontal will be added a positive or negative sign if above and below the horizontal, respectively. Negative values are naturally only limited to the lower categories of this scale. Height of flight categories apply to vertical height, which should be carefully recorded and not to be confused with side distance.

0 – Below eye level
1 – Eye level to about 30 meters
2 – Birds seen easily with unaided eye (eyeglasses not counted as aids)
3 – At limit of unaided vision
4 – Beyond limit of unaided vision but visible with binoculars – to 10x
5 – At limit of binoculars
6 – Beyond limit of binoculars 10x or less, but can detect with binoculars or telescope of greater power (mark "1" in comment box and note magnification)
7 – No predominant height

APPENDIX 3
SEASONAL METADATA FORM

Recorder name	
Position at monitoring site	
Mailing address	
Phone number	
E-mail	
Date filled	

Monitoring Site Specifics	
Location name	
County/Municipality	
State/Province	
Country	
Latitude	
Longitude	
Elevation	
Data source	Topographic maps Published literature Geographic Positioning System (GPS)
Type of location (fixed or mobile) if mobile, label each location separately (e.g. site A, B, or C) and provide latitude, longitude, and elevation for each site. Add additional sheets if necessary.	Fixed Mobile
Part of survey line?	Yes No
Photo documentation of 360 degree view of site?	
Tower, building, or vantage point used (attach photo)	Yes No
Seasonal coverage	Spring Fall
Periodicity of operation	Daily Regular not daily Weekend Irregular
Start and end dates of coverage	
Daily times of operation (start/end times)	
Type of migration	Divesion Line Leading Line
Species covered (See Table 1 for species codes)	BV TV OS SK WK MK PK HK BE NH SS CH NG GH

	CB HH RS BW ST SW WT ZT RT FH RL GE CC AK ML GY PG PR
Sex, age, color morph, and subspecies data available?	Yes No

Data Recording and Data Storage	
	Protocol in use at your site
Wind speed	1 2 3
Wind direction	1 2 3
Temperature	1 and 2 3
Humidity	1 and 2 3
Barometric pressure	1 and 2 3
Cloud cover	1, 2, and 3
Cloud type	??
Visibility	1 2 and 3
Precipitation	1 and 2 3
Flight direction	1 and 2 3
Height of flight	1 and 2 3
Observers	1 2 and 3
Duration of observation	1, 2, and 3
Binoculars (List brand name and power of each observer's binoculars, e.g. Zeiss Conquest 10x40, Leica Trinovoid 10x40, etc.)	
Telescope(s) and eyepieces (ibid, e.g. Leica straight/angled 77 mm, 20-60 zoom eyepiece, etc.)	
Identification aids in use at monitoring site	Clark and Wheeler. Hawks of North America Wheeler and Clark. A photographic guide to North American

	raptors Dunne et al. Hawks in Flight Liguori. Hawks from Every Angle Sibley. The Sibley guide to the birds (or Eastern, Western version of it) Other: _____
Tally counters?	
Hand weather recording equipment (list all, include brand name and model of each, e.g. Thermometer Forestry Supplies model B in degrees centigrades, Windmeter xxx, etc. Electronic hand weather meter (e.g. Kestrel xxx)	Electronic weather station Manual weather station Hand electronic Hand manual
Owl decoy?	Yes No
Other personal care equipment available on site	
Regular number of observers on site	1 2 3 4 Other: ___
"Average" experience of observers (add comments at the end of this form if necessary – list team's complete names and field seasons of experience of each observer)	1 field season of experience 2-5 field seasons of experience 6-10 field seasons of experience >11 field seasons of experience
Are there written "job descriptions" for members of the team?	Yes No
No. of professional (paid) observers in team	
No. of volunteer (unpaid) observers in team	
Disturbance on site	0 None 1 Low 2 Moderate 3 High
Is there a detailed training scheme for team members before the season start? (attach documents as necessary, e.g. training workshop contents)	Yes No
Data storage	HawkCount.org Other electronic databases Paper forms
Location of data storage	HawkCount.org HMANA's paper archive Other: _____ (give address where data is physically stored and name of data curator)
Comments and attachments	

Prepared by Ernesto Ruelas Inzunza. Version 11 April 2006

APPENDIX 4

Detroit River Hawk Watch
Visibility Reference Points

From Lake Erie Metropark

Trenton Channel Power Plant: 4.94 km

Navigation Light to South-Southeast: 6.46 km

Canada shoreline past south end of Celeron Island: 6.78 km

South tip of Celeron Island: 1.88 km

South Tip of Horse Island: 0.58 km

From Pointe Mouillee

Navigation Light to the East: 5.15 km

Canada shoreline: 6 km

APPENDIX 5

DETROIT RIVER HAWK WATCH
2010

PRIMARY COUNTER
Spotter
Outreach Personnel (at least 3hours between 11AM and 3PM

Photo credit: Rodney Laura

For cancellations, call Greg Norwood:

September

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
			1 *PAYNE* Maki *Norwood*	**2** *PAYNE* Howland	**3** *PAYNE* Elliot	**4** *SCHULTZ* Payne *Fountain*
5 *SCHULTZ* Laura *Fountain*	**6** *SCHULTZ* Mulawi	**7** *PAYNE* Kirn	**8** *PAYNE* Maki	**9** *PAYNE* Howland	**10** *PAYNE* Elliot	**11** *SCHULTZ* Payne *Barron* *McCullough*
12 *SCHULTZ* Laura *Barron*	**13** *PAYNE* Mulawi	**14** *PAYNE* Kirn	**15** *PAYNE* *SCHULTZ* Maki	**16** *SCHULTZ* *PAYNE* Howland	**17** *PAYNE* *SCHULTZ* Elliot *Norwood*	**18** *SCHULTZ* *PAYNE* Sherwood *Barron* *McCullough*
19 *PAYNE* *SCHULTZ* *HAAS* *Laura*	**20** *PAYNE* *NORWOOD* Mulawi	**21** *PAYNE* *NORWOOD* Kirn	**22** *PAYNE* Maki	**23** *PAYNE* Howland	**24** *PAYNE* Elliot *Laura*	**25** *SCHULTZ* Sherwood *Cichon*
26 *SCHULT* *Ward*	**27** *PAYNE* Mulawi	**28** *PAYNE* Kirn	**29** *PAYNE* Maki	**30** *PAYNE* Howland		

2010

Photo credit: Jeff Schultz

Photo credit: Seth Cutright

For cancellations, call Greg Norwood:

October

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
					1 *PAYNE* Elliot	**2** *PAYNE* Laura *Barron* *McCullough*
3 *SCHULTZ* Laura *Chordash*	**4** *PAYNE* Mulawi	**5** *PAYNE* Kirn	**6** *PAYNE* Maki	**7** *PAYNE* Howland	**8** *PAYNE* Elliot Norwood	**9** *PAYNE* Sherwood *Fountain*
10 *SCHULTZ* Laura *Chordash*	**11** *PAYNE* Mulawi	**12** *PAYNE* Kirn	**13** *PAYNE* Maki	**14** *PAYNE* Howland	**15** *PAYNE* Elliot	**16** *PAYNE* Laura *Barron*
17 *PAYNE* Laura *Barron*	**18** *PAYNE* Mulawi	**19** *PAYNE* Kirn	**20** *PAYNE* Maki	**21** *PAYNE* Howland	**22** *PAYNE* Elliot *Laura*	**23** *PAYNE* Event staff *Montague*
24 *HAAS* *SCHULTZ* *Metropark* *volunteer* *vacant*	**25** *PAYNE* Mulawi	**26** *PAYNE* Kirn	**27** *PAYNE* Maki	**28** *PAYNE* Howland	**29** *PAYNE* Elliot *Norwood*	**30** *PAYNE* Sherwood *Barron*
31 *SCHULTZ* Laura *Barron*						

2010

Photo credit: Jeff Schultz

Photo credit: Jerry Jourdan

For cancellations, call Greg Norwood:

November

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
	1 *PAYNE* Mulawi	**2** *PAYNE* Kirn	**3** *PAYNE* Maki	**4** *PAYNE* Howland	**5** *PAYNE* Elliot *Laura*	**6** *PAYNE* Kirn *Montague*
7 *HAAS* *Cichon*	**8** *PAYNE* Mulawi	**9** *PAYNE* Kirn	**10** *PAYNE* Maki	**11** *PAYNE* Howland	**12** *PAYNE* Elliot	**13** *PAYNE* Sherwood *Barron*
14 *HAAS* Laura *Chordash*	**15** *PAYNE* Mulawi	**16** *PAYNE* Kirn	**17** *PAYNE* Maki	**18** *PAYNE* Howland	**19** *PAYNE* Elliot	**20** *PAYNE* Maki *Barron* *McCullough*
21 *PAYNE* Laura *Barron*	**22** *PAYNE* Mulawi	**23** *PAYNE* Kirn	**24** *PAYNE* Maki	**25** *PAYNE* Howland	**26** *PAYNE* Elliot	**27** *PAYNE* Mulawi *Barron*
28 *PAYNE* Laura *Barron*	**29** *PAYNE* Mulawi	**30** *PAYNE* Kirn				

2010

Detroit River Hawk Watch LEMP Volunteers
2010 Season

Date	Name
Friday, September 24th	Rodney Laura
Saturday, September 25th	Emily Cichon
Sunday, September 26th	Denise Ward
Friday, October 22nd	Rodney Laura
Saturday, October 23rd	Rita Montague
Sunday, October 24th	Rita Montague
Friday, November 5th	Rodney Laura
Saturday, November 6th	Rita Montague
Sunday, November 7th	Emily Cichon

Name	# of Shifts	Phone Number	Email Address
Rodney Laura	3		
Rita Montague	3		
Emily Cichon	2		
Denise Ward	1		

U.S. Fish and Wildlife Service Volunteers

Rob Payne (primary	
Jeff Schultz (primary	
Fred Kirn (spotter)	
Raburn Howland (spotter)	
John Elliot (spotter)	
Pat Mulawi (spotter)	
Josh Haas (primary	
Joe Chordash (outreach)	
Jim Maki (spotter)	
Joy Barron (outreach)	
Tom Fountain (outreach)	
Don Sherwood	
Gerry Wykes (Lake Erie	

Appendix 6.

Detroit River Hawk Watch - Detroit River International Wildlife Refuge

Hourly Raptor Tally & Conditions Form

WSPD		CLCV	
WFM		VISB	
TEMP		PREC	
HUMI		FDIR	
BARO		HEFL	
OBSV		DURA	

Location LEMP [ ] PM [ ]

Primary Counter (2 during high volume only)

1. start time end

2. start time end

Assistant (max of two when 1 primary counter)

1. start time end

2. start time end

max of three person crew at all times; additions only quarter hourly

Date (YY/MM/DD) / /

Hour Start

Hour End

quarter hourly only

TOTALS on right

Raptor / Age / Tally			Raptor / Age / Tally		
TV					
OS			BE	Adult	
GE	Adult			Sub-adult	
	Sub-adult			Unknown	
	Unknown		NH	Adult	
NG	Adult			Juvenile	
	Juvenile			Unknown	
	Unknown				
SS	Adult				
	Juvenile				
	Unknown				
CH	Adult		RS	Adult	
	Juvenile			Juvenile	
	Unknown			Unknown	
BW	Adult				
	Juvenile				
	Unknown				
RT	Adult		AK		
	Juvenile		ML		
	Unknown		PG	Adult	
RL	Light			Juvenile	
	Dark			Unknown	
RR	all details possible		UA		
			UB		
			UF		
			UR		

Non-Raptor Observations:

General notes on migration, count, and visitors:

Code	Condition	Protocol 1 Codes
WSPD	Wind Speed (km/hr)	0 (0) 1 (1 - 5) 2 (6 - 11) 3 (12 - 19) 4 (20 - 28) 5 (29 - 38) 6 (39 - 49) 7 (50 - 61) 8 (62 - 74) 9 (75 +) U (Unknown)
WFM	Winds 'From'	(NW, NNW, N, NNE, NE, ENE, E, ESE, SE, SSE, S, SW, WSW, W, WNW, Calm, Variable)
TEMP	Temperature (°C)	
HUMI	Humidity (%)	
BARO	Barometric Pressure (inches Hg)	
OBSV	# all primaries / assistants	
CLCV	Cloud Cover (% Clouds covering skies)	
VISB	Visibility (km)	**Clear = 10 miles; LEMP** - South Tip of Horse Island: **0.58 km**, South tip of Celeron Island: **1.88 km**, Trenton Channel Power Plant: **4.94 km**, Navigation Light to South-Southeast: **6.46 km**, Canada shoreline past south end of Celeron Island: **6.78 km; PMSGA -** Navigation Light to the East: **5.15 km** Canada Shoreline: **6 km**, Island directly east: **0.49 km**, Island to southeast: **0.65 km**
PREC	Precipitation	**0** (none), **1** (Haze or Fog), **2** (Drizzle), **3** (Rain), **4** (Thunderstorm), **5** (Snow), **6** (Wind-driven dust, sand, or snow)
FDIR	Flight Direction	Migrants are heading: **(NW, NNW, N, NNE, NE, ENE, E, ESE, SE, SSE, S, SW, WSW, W, WNW)**
HEFL	Height of Flight	**0** (Below eye level), **1** (Eye level to about 30 meters), **2** (Birds seen easily with unaided eye), **3** (At limit of unaided vision), **4** (Beyond limit of unaided vision but visible with binoculars – to 10x), **5** (At limit of binoculars), **6** (spotting scope needed),
DURA	Duration (min.)	

HMANA Code	Raptor
TV	Turkey Vulture
BE	Bald Eagle
GE	Golden Eagle
OS	Osprey
NH	Northern Harrier
SS	Sharp-shinned Hawk
CH	Cooper's Hawk
NG	Northern Goshawk
RS	Red-shouldered Hawk
BW	Broad-winged Hawk
RT	Red-tailed Hawk
SW	Swainson's Hawk
RL	Rough-legged Hawk
AK	American Kestrel
ML	Merlin
PG	Peregrine Falcon
UA	Unknown *Accipiter*
UB	Unknown *Buteo*
UF	Unknown Falcon
UR	Unknown Raptor
RR	Rare Raptor

Three-person crew scenario #1: When flight volume is such that only one primary counter is sufficient to count and identify all passing migrants. Under this scenario, there is one primary counter and two assistant counters. The two assistant counters split the six duties of the assistant counter (see right).

Three-person crew scenario #2: When flight volume is very high such that the one primary counter cannot reasonably keep up with counting and identifying all passing migrants. Under this scenario (at the request of the primary counter), one of the assistant counters may effectively become a second primary counter. The primary counter will give the secondary counter a distinct portion of the sky in which he/she will count and identify raptors, communicating the count data to the other assistant counter. Under this scenario, the other (third) assistant counter will assume responsibility for all his/her assigned duties listed above.

This data sheet was prepared by Jerry Jourdan

Primary counter:

Primary scanner of the sky. Responsible for determining and verifying the total number, age, sex, and color morph of migrating birds of each species for each hour of the counting day.

The 'final say' in identification of a raptor. *However, the primary counter should remember… there is an unidentified raptor category on the datasheet. When the primary counter is unsure of an identification (an unavoidable situation at any site), he/she should not hesitate to use this column.*

Assistant counter(s):

Responsible for tallying migrants and recording migrant numbers and other data on the datasheet.

Responsible for collecting all necessary weather data at the appropriate intervals during the counting day.

Responsible, when not tallying or recording, for scanning the sky to supplement the efforts of the primary counter.

Responsible for providing a "second opinion" or advice on a puzzling or distant identification (when requested by the primary counter).

Responsible for scanning while the primary counter confirms the identity of a bird. This is so the primary counter can put his/her attention to the bird to obtain more information (i.e. sex, morph, migration status, etc.)

Responsible for use of reference materials – getting identification help from the on-site reference aids (when requested by the primary counter).

Responsible for engaging visitors, if appropriate and if time permits, in order to answer their questions or provide an update on the count. Also, some visitors may not be aware of the methods and rules outlined in this protocol. This person should also be responsible for ensuring every visitor is aware of the protocol and deterring visitors from compromising the integrity of the count (see discussion below on this) *Note: while making visitors at feel welcome at the count site is important, it should never come at the expense of the accuracy of the count. All members of the counting crew and all volunteers should be aware that the count comes first, and visitors second.*