



**Post-Delisting Monitoring Plan Guidance
Under the Endangered Species Act**

U.S. Fish and Wildlife Service
and
National Marine Fisheries Service

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1.0 Purpose

Post-delisting monitoring (PDM) refers to activities undertaken to verify that a species delisted due to recovery remains secure from risk of extinction after the protections of the Endangered Species Act (ESA) no longer apply. The primary goal of PDM is to monitor the species to ensure the status does not deteriorate, and if a substantial decline in the species (numbers of individuals or populations) or an increase in threats is detected, to take measures to halt the decline so that re-proposing it as a threatened or endangered species is not needed. A PDM planning and implementation timeline is provided in Appendix A

1.2 Legal requirements

Section 4(g), added to the ESA in the 1988 reauthorization, requires the U.S. Fish and Wildlife Service and National Marine Fisheries Service (Services) to implement a system in cooperation with the states to monitor for not less than five years the status of all species that have recovered and been removed from the list of threatened and endangered plants and animals (list; 50 CFR 17.11, 17.12, 224.101, and 227.4). Section 4(g)(2) directs the Services to make prompt use of their emergency listing authorities under section 4(b)(7) to prevent a significant risk to the well-being of any recovered species. While not specifically mentioned in section 4(g), authorities to list species in accordance with the process prescribed in section 4(b)(5) and 4(b)(6) may also be utilized to reinstate species on the list, if such an action is found to be appropriate.

The legislative history of section 4(g) indicates that Congress intended to give the Services and states latitude to determine the extent and intensity of PDM that is needed and appropriate. The ESA does not require the development of a formal PDM “plan.” However, the Services envision few, if any, instances where some type of written planning documentation will not substantially contribute to the effective implementation of section 4(g) by guiding collection and evaluation of pertinent information over the monitoring period and articulating the associated funding needs.

1.2 Scope of requirements

The PDM requirements of section 4(g) apply without exception to all species delisted due to biological recovery, but do not pertain to species delisted for other reasons (e.g., taxonomic revision, or extinction). The reason(s) for delisting and implications under section 4(g) should be included in each final delisting determination.

Example: The Idaho springsnail was delisted in 2007 because a study in 2004 revised the taxonomic classification of the species, making the listed entity part of a more widely distributed taxon, the Jackson Lake springsnail. The requirements of section 4(g) were not triggered by this delisting.

Example: The Peregrine Falcon was delisted in 1999 because data indicated it had recovered following restrictions on organochlorine pesticides and implementation of successful management activities. The requirements of section 4(g) were triggered by this delisting and the Service worked closely with state wildlife agencies in the development and implementation of a PDM plan.

1.3 Role of the states, other Service programs, and other partners in Post-delisting Monitoring for domestic species

Section 4(g) explicitly requires cooperation with the states in development and implementation of PDM programs. The Services encourage state agency(ies) to adopt the lead role in planning and implementation of PDM, when appropriate. Because the Services are responsible for compliance with the ESA, however, they must, at a minimum, maintain an active role in all phases of PDM to assure that the requirements of section 4(g) are met.

The Services and states should solicit active participation of other entities that are expected to assume responsibilities for the species' conservation post-delisting or that can contribute expertise or resources for development and implementation of PDM plans. These may include, but are not limited to the following:

- A. *Other Service programs.* Programs within the Services that have responsibilities relative to a species' conservation or management, and will likely participate in PDM should be encouraged to participate in PDM planning. These programs include, but are not limited to, the Migratory Birds Program to monitor migratory birds, Office of Habitat Conservation to monitor restored habitat, Office of Sustainable Fisheries to monitor federally-managed fish or species affected by such fish, Marine Mammal Programs within both agencies to monitor marine mammals, the Offices of Scientific Authority or Management Authority at FWS or the Office of International Affairs at NMFS to monitor species regulated by the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), and the National Wildlife Refuge System, the National Marine Sanctuary Program, or National Estuarine Research Reserves to monitor species that occur on these lands or in these waters. If post-ESA Service responsibilities include active management of the species (e.g., issuance of permits under the Migratory Bird Treaty Act), then monitoring for management and PDM efforts should be coordinated to the maximum extent possible (see also discussion under section 2.3, Relationship between post-delisting monitoring and monitoring needed for post-delisting management of the species).
- B. *Other Federal resource management agencies.* This is most likely to apply to those agencies with natural resources management mandates, such as the U.S. Forest Service, Bureau of Land Management, National Park Service, and Department of Defense.
- C. *Native American tribes.*
- D. *Any other entity or landowner that has made commitments to long-term protection and/or management of the species or its habitats.* This is particularly important if these commitments received, or will receive significant consideration in the delisting determination. For example,

implementing agreements for some Section 10(a)(1)(B) permits provide conservation commitments that will continue if the species is delisted.

- E. *Others.* Involvement of other interested groups, including conservation organizations that were active participants in recovery, individuals from academic institutions, and other scientists, should be encouraged.

The Services must remain aware of the requirements of the Federal Advisory Committee Act (FACA; 5 U.S.C. Appendix 2). The development of a PDM plan must either comply with FACA or be conducted via a recovery team, which are exempt from FACA. If a recovery team already exists, this team may develop the plan or a subcommittee of the team may be set up to develop the plan.

PDM will often be a small and transitory portion of much longer and more extensive post-delisting conservation commitments by these organizations. Their involvement in both the planning and implementation phases of PDM is an important step in building and maintaining these continuing commitments.

1.4 Post-delisting Monitoring for species in foreign countries

In the case of species occurring outside the United States (both trans-boundary species and those with wholly foreign ranges), the Services will follow guidelines found in this document where practicable, recognizing that the authority of the ESA and capabilities of the Services are much more limited outside the United States. Section 8(b) of the ESA directs the Services to encourage foreign nations to establish and carry out endangered species conservation programs.

The Services will seek partnerships and the active participation of foreign governments in the monitoring of any recovered species. In some cases, the foreign government may develop and implement PDM plans (see example below), but other governments may have very limited monitoring expertise and/or resources. In these situations, the Services will need to partner with the foreign countries to obtain the requisite PDM information from other sources. Possible cooperators include non-governmental conservation organizations, academic institutions, eco-tourism businesses, or commercial exporters. Approaches to both PDM planning and implementation must be tailored to each species and country.

<p>Example: Three species of Australian kangaroos in Australia were delisted in 1995. The Commonwealth Government agreed to provide five annual monitoring reports to the FWS.</p>

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2.0 Post-delisting Monitoring and other data

This section describes how PDM relates to other data collected before, during and after listing.

2.1 Relationship between Post-delisting Monitoring and data cited in the original listing

In most cases, species being delisted due to recovery were originally placed on the list 15 to 30 (or more) years ago. In the intervening time, it is likely that important changes will have occurred, including increased understanding of the species' biology and demography and changes in the nature or understanding of threats to the species. In addition, data standards relative to listing and delisting under the ESA have evolved since enactment of the law in 1973. Therefore, data required to satisfy delisting and PDM requirements may differ substantially from data that was considered necessary and appropriate to support the original species listing.

Example (hypothetical): The historic decline of a large predator was due in large part to human persecution, including shooting, trapping, and poisoning. During the recovery period, however, disease emerged as a new threat. While disease mortality has substantially abated in recent years, it may be prudent to consider the need for some type of disease monitoring during PDM planning, especially in areas where the species' density is becoming relatively high.

2.2 Relationship between Post-delisting Monitoring and monitoring conducted to assess attainment of delisting criteria in recovery plans

“Objective, measurable” delisting criteria, as required by section 4(f)(1) of the ESA, often include demographic and distributional parameters and reductions in threats to the species that will demonstrate that a species no longer meets the definitions of threatened or endangered. In many cases, these delisting criteria are formulated to assure a low probability of incorrectly inferring that a species is more secure than it actually is due to sampling error. In addition, delisting criteria often contain requirements that population abundance or density, productivity, survival and/or distributional targets, and reduction of threats be maintained for some period of time in order to demonstrate that they are sustainable.

PDM should be based on data collected during the recovery period to build on established data sets that document “baseline” conditions, i.e., conditions that existed prior to delisting. The Services anticipate that data collection to satisfy requirements of section 4(g) will generally be a subset of that which was collected in support of the delisting rule. Absent a specific, well-supported rationale relative to a particular species, PDM plans should not contain different or more intensive monitoring methods than those that were implemented during the recovery effort and/or to assess attainment of delisting criteria. In other words, post-delisting monitoring should be consistent with and comparable to

monitoring prior to delisting to aid in detecting trends, although they'll likely be less intensive than monitoring efforts prior to delisting as long as they ensure that the status of a delisted species does not deteriorate substantially following removal from the list. However, PDM plans may contain different or more intensive monitoring methods than those that were implemented during the recovery effort when the historical sampling methods are inadequate to ensure that the status of a delisted species does not deteriorate following removal from the list, or if more effective or efficient monitoring methods are available that were not available during the recovery period, making more intensive monitoring possible without more effort.

2.3 Relationship between post-delisting monitoring and monitoring needed for post-delisting management of the species

Delisting criteria for some species include assurances that active management to mitigate residual threats will be implemented after delisting. Residual threats refer to threats that, collectively, are sufficiently reduced and contained that the species no longer meets the definition of threatened or endangered. In many cases, these management requirements are long-term or even perpetual. Some delisted species may also be subject to managed harvest, necessitating additional data-gathering efforts.

Monitoring data should be used for both PDM and to monitor management efforts to maximize efficiency of overall expenditures and to minimize any stress on the species caused during data collection. Integration of management and PDM planning is encouraged. However, if the evaluation of a species' status in a delisting decision is premised on commitments to implement some post-delisting management, PDM funding should be used sparingly, if at all, in support of the monitoring components required for management. Use of PDM funding to support post-delisting management is generally inappropriate, because it confounds the purpose of PDM, which is to verify that the species remains secure without the protections (including funding) of the ESA. Any decision to allocate PDM funding for management-related monitoring must be carefully justified relative to these considerations.

Example (hypothetical): Delisting criterion #4 in the Atlantic Coast piping plover recovery plan is to “Institute long-term agreements among cooperating agencies, landowners, and conservation organizations that will ensure protection and management sufficient to maintain population targets and average productivity for each recovery unit [specified in criteria 1 and 3].” Atlantic Coast piping plover productivity is closely linked to active protection from wide-spread, intensive recreational disturbance and human-abetted predation. Many landowners have elected to implement the practice of early detection of breeding pairs so that their territories can be fenced and the timing, location, and types of restrictions on human use can be minimized. One of the most important functions of PDM in this case would likely be to determine whether continuing management commitments (including underlying monitoring) envisioned in this criterion are implemented after the species is delisted. While it would be acceptable to use information collected in the course of management (and paid for by non-ESA funding sources) to fulfill PDM requirements, the reverse (using PDM funding to continue data collection which is needed to support management) would be beyond the purpose of section 4(g).

3.0 Post-delisting monitoring prior to delisting activities

PDM plan development will typically be an iterative process, incorporated into recovery planning, refined during the latter stages of recovery, and culminating in a fully-developed proposed plan that is ready to be released at the time the species is proposed for delisting.

3.1 Consideration during recovery planning and implementation

The monitoring section of the recovery plan should discuss the eventual need for a PDM plan, the relationship between recovery monitoring and PDM and, to the extent possible, identify the parameters to be monitored after delisting. This will ensure that (1) collection of PDM baseline data during recovery will not be overlooked, and (2) stakeholders and the public are informed about monitoring activities anticipated after delisting. At a minimum, recovery plans for recently listed species should identify the development of a PDM plan as a task to be accomplished in the latter stages of the recovery process. PDM planning should be appraised during five-year reviews of listed species required under section 4(c)(2) and, if not already initiated, should be included in the list of Recommendations for Future Actions. Detailed PDM planning should be initiated 5 to 10 years prior to anticipated delisting to the maximum extent practicable. If a formal recovery plan revision projects recovery within 10 years, the plan should explicitly address the types and intensity of PDM deemed appropriate for the species. This will facilitate a smooth transition between pre- and post-delisting monitoring, and assure that information needed for PDM design (e.g., sampling error estimates) is obtained prior to delisting.

3.2 Consideration during the delisting process

A complete draft PDM plan should be prepared and included in the delisting proposal package when it is forwarded to the Washington or Headquarters Office. A brief summary of the draft PDM plan should be included in the Effects of Rule section of the proposal, along with a statement of availability of the entire draft PDM plan for review during a comment period that runs concurrent with the one for the proposed delisting rule. Since the delisting process should not be delayed for species that no longer require ESA protection, it is critical to assure timely PDM plan preparation and approvals. See section 6.0, Administrative responsibilities and requirements, regarding public and scientific peer review and approval of PDM plans.

4.0 Post-delisting Monitoring planning

The PDM plan should include an explicit rationale for selection of each monitoring component, its frequency, intensity, and duration in relation to the species' biology, current status, and the types and potential effects of residual threats. It is critical that the rationale for each PDM planning decision be fully documented. This documentation serves not only to justify the monitoring decisions, but provides vital information about underlying considerations for those charged with implementation, evaluation, and possible modification of the PDM plan. See also Appendix B for a suggested PDM plan outline.

4.1 Deciding what to monitor

PDM should be tightly focused on collecting and evaluating data that are most likely to detect increased vulnerability of the species following removal of ESA protections. Relatively good information about life history, demography and threats is available for most species that are ready for delisting, and this information should form a solid basis for deciding what to monitor. In addition to demographic parameters, components of PDM plans will generally involve monitoring residual threats, and may also involve looking at habitat conditions and implementation of legal or management commitments.

Determining which parameters should be monitored needs to be done in conjunction with data on detectability, life history, and biology of the species. Population censuses may be appropriate for conspicuous, long-lived species. Annual plants or insects that fluctuate greatly in abundance according to weather may be best surveyed based on habitat surrogate (if they can be shown to be appropriate and reliable) or via counts that are conducted during favorable climatic conditions. Direct monitoring of threats that could have delayed or secondary effects on populations (contaminant levels, recreational use patterns, etc.) may also be appropriate and valuable in some cases.

4.1.1 Residual threats

The rule-making process for delisting entails a formal analysis of the factors in section 4(a)(1) and their effect on the species' vulnerability to extinction. This analysis should indicate residual pressures on the species that warrant monitoring. The need to monitor specific threats should be carefully documented and an effort should be made to identify monitoring methods that can take advantage of other ongoing monitoring efforts.

Example (hypothetical): The level of a certain contaminant that can adversely affect a soon-to-be delisted species has been well-established during the recovery period. If it is deemed appropriate to include potential re-emergence of this threat as one component of PDM, the most efficient and least intrusive approach may be to monitor contaminants in this species' prey base.

4.1.2 Demographic parameters

PDM plans should involve monitoring both the threats and the species' response to those threats, where appropriate. The species response may involve the examination of one or more demographic parameter(s). This would aid in estimating the scope, intensity, and change of any threat. For some species, especially those with multiple populations or life stages, different threats may affect one population or life stage at a certain location or time and not others. Demographic parameters may be critical for identifying situations in which new threats, previously unidentified, affect the species. Reasons for selecting demographic parameters should be clearly articulated.

In a few cases, PDM may include demographic parameters that were not tracked to assess progress towards delisting. Abundance and distribution of mature breeders or fruiting plants, for example, may be useful, especially if their measurement is conditioned to reflect survival over the species' entire life cycle (i.e., by excluding from abundance targets any individuals that were bred or reared in captivity). For late-maturing species, however, monitoring abundance of breeding adults may be a poor choice for PDM, especially if the goal is early detection of declines that are triggered by threats that result in a drop in fecundity or juvenile survival. Recommendations to include demographic characteristics in PDM that are not monitored during the recovery period should be thoroughly justified. In most such cases, monitoring of the new parameters should be initiated before delisting to validate the data-collection methods and establish a solid baseline for comparison with PDM.

Example (hypothetical): A 30-year recovery effort for a long-lived, late-maturing, non-anadromous fish has resulted in substantially improved survival of all juvenile age-classes, as well as a large increase in the population of mature spawners. At the time of delisting, experts agree that the most likely potential risk to the species is future loss or degradation of juvenile-rearing habitats. Since adult survival and near-term abundance are likely to remain high for an extended period of time even if spawning and/or juvenile rearing habitats deteriorate, PDM focuses on sampling abundance of age 2 and 3 fish.

4.1.3 Implementation of legal and/or management commitments

Some delisting determinations are premised on commitments by responsible agencies to exercise other (non-ESA) regulatory mechanisms (e.g., state or local laws, Clean Water Act provisions) on behalf of the species. In other cases, long-term commitments to implement active management (e.g., a specific forest management regime, prescribed fire, predator management) for the benefit of a species may be an important factor in the reduction of threats considered in a delisting determination. Unless independent mechanisms for oversight of these commitments are provided, it may be appropriate for PDM to incorporate periodic review of whether management measures are being implemented as agreed, as well as whether the anticipated effects are being realized on the ground.

4.2 Defining thresholds/triggers for monitoring outcomes and conclusions

Effective PDM requires timely evaluation of data and responsiveness to observed trends. PDM data should be assessed at pre-determined intervals to determine whether the data collection protocols are functioning as anticipated and whether any changes in species protection are needed. Potential outcomes include, but may not be limited to:

A. PDM indicates that the species remains secure without ESA protections. PDM could be concluded at the completion of the timeframe specified in the PDM plan. Delisting criteria and the formal rule-making process for removal from the list are designed to provide reasonable confidence that the species will remain secure for the foreseeable future, and PDM provides an additional “check” on projections that the species will remain secure after removal of ESA protections. There are no absolute guarantees against future declines, but if the species appears to remain secure, conclusion of PDM is appropriate. However, it should be noted that there may be circumstances in which monitoring will continue, even after PDM is concluded, regardless of the PDM outcome. For example, monitoring may be continuous for a species that occurs primarily on Fish and Wildlife Refuge land where that refuge was specifically established to conserve that species.

B. PDM indicates that the species may be less secure than anticipated at the time of delisting, but information does not indicate that the species meets the definition of threatened or endangered. At a minimum, the duration of the PDM period should be extended. In some cases, it may be appropriate to intensify PDM (e.g., by adding parameters or by increasing the frequency of sampling) to increase the probability of detecting any future declines. Responsible authorities may also choose to initiate programs to determine the causes of unanticipated declines and/or implement conservation measures under regulatory authorities other than the ESA.

C. PDM yields substantial information indicating threats are causing a decline in the species' status since delisting, such that listing the species as threatened or endangered may be warranted. In addition to activities discussed under B, above, the Services should initiate a formal status review to assess changes in threats to the species, its abundance, productivity, survival, and distribution and determine whether proposal for relisting is appropriate.

D. PDM documents a decline in the species' probability of persistence, such that the species once again meets the definition of a threatened or endangered species under the Act. In the event that PDM reveals that a delisted species is threatened (i.e., likely to become endangered in the foreseeable future throughout all or a significant portion of its range) or endangered, then the species should be promptly proposed for relisting under the ESA in accordance with procedures in section 4(b)(5). Likewise, if the best available information indicates an emergency that poses a significant risk to the well-being of a delisted species,

then the responsible Service should exercise its emergency listing authority under section 4(b)(7) accordingly.

Each PDM plan should provide a species-specific discussion of the circumstances that would trigger termination of PDM, intensification of PDM, initiation of a new status review, or emergency listing (potential outcomes A, B, C and D above). Such decisions often require consideration and interpretation of multiple factors, including changes in threats and/or demographic trends. Therefore, this section of the PDM plan may not be limited to quantitative criteria, but also include qualitative considerations (such as indicators of changing threats) and guidance on how demographic data should be interpreted (for example, to separate a decline in productivity due to a recurring or new threat versus a decline due to expected effects of density-dependence). The narrative may also include guidance on how multifaceted PDM results might be integrated to support biologically sound decision-making. In most cases, specification of these triggers or thresholds will be based on information and decision-making processes documented during the recovery planning and delisting processes.

Example: The Data Evaluation section of the American peregrine falcon PDM plan specifies response triggers that would prompt evaluation by the national monitoring team. It also provides discussion of important factors, including weather and attainment of carrying capacity, that will be considered when evaluating productivity data.

For species subject to natural cyclic trends or substantial environmental variation, the expected range and frequency of variation should have been well-documented during the recovery period and appropriately considered in the PDM plan. If a species may approach carrying capacity in some or all parts of its range during the PDM period, then biologists must anticipate the possibility that density-dependent factors may trigger declines in productivity and/or survival and provide measures to distinguish these from signals that the species is exhibiting a bonafide decline in its probability of persistence.

Since most PDM plans will comprise a subset of monitoring conducted during the recovery period, unanticipated problems related to data collection protocols (e.g., higher than expected sampling error) should arise infrequently. Where such problems do occur, however, a thorough analysis should be performed to assess the potential causes and to identify and implement appropriate remedies.

4.3 Frequency and duration of monitoring

Section 4(g) requires that PDM *effectively* monitor the species for not less than five years after delisting (emphasis added), but no frequency is specified. Decisions regarding frequency and duration of effective monitoring, should appropriately reflect the species' biology and residual threats. Factors that should be considered include age of sexual maturity (if reproducing individuals are being monitored) and anticipated power to detect a statistically significant change. The nature of the residual threats and the rate at which they might manifest their effects on the species should also be considered. For many species, the most efficient monitoring might be that of threats or habitat. If substantial

information indicates threats are still present and causing a decline in the species' status since delisting, such that listing the species as threatened or endangered may be warranted, a species status review should be initiated.

The ESA states that PDM should continue for a minimum of 5 years. For some species this will be adequate; but for others, such as long-lived species, a longer period may be required to detect any changes in species' trends, habitat or threats. Factors that support an extended monitoring duration will often justify a multi-year monitoring interval (e.g. monitoring every 2 or 3 years rather than every year). While decisions regarding the frequency and duration of monitoring are at the discretion of the Services and partners, the administrative record should thoroughly document why the selected interval and duration are appropriate for the species at issue.

While PDM should be sufficient to meet the spirit and letter of section 4(g), it should be confined to the time period needed to verify that removal of ESA protection did not cause a deterioration of status that would warrant re-listing. Delisting returns responsibility for a species' management to other authorities, where they exist, and this responsibility includes attention to future threats and/or species declines that are not sufficient to warrant delisting. Termination of PDM enables the reallocation of funding and other resources to species in more critical need of ESA protections and funding.

Example (hypothetical): Many marine mammals are only detectable during brief appearances at the surface of the ocean and their life history results in slow changes in population indicators over many years. Surveys are expensive and, when conducted by aircraft, dangerous. The frequency of marine mammal surveys must balance cost factors with desired levels of precision, ability to detect trends in abundance with a specified probability, and limitations on the probability of incorrectly classifying a stock relative to management goals. Experience indicates that the recommended survey intervals are between 1 and 8 years, depending on the level of precision that has been achieved in previous estimates of abundance and human-caused mortality.

Example (hypothetical): Triennial surveys of a perennial plant have shown very stable numbers for 15 years prior to delisting. PDM will consist of two surveys, one each in years 2 and 5.

Example (hypothetical): Duration of PDM for a darter that is subject to periodic droughts that strongly affect the species' survival, is set at 20 years or completion of one drought of specified magnitude, whichever comes last. This will provide an extra "check" on this aspect of the species' security, as the delisting criteria also require that abundance criteria be sustained through a drought.

4.4 Sampling considerations

Monitoring design and implementation issues will vary widely with the life history, range, and distribution of the species, the nature of residual threats, and many other factors. It is critical that the PDM plan be carefully tailored to the species' specific situation. Just as there is no "cookbook" for determining what to monitor, there is no formula for deciding whether and what sampling techniques are appropriate or how much statistical power is acceptable. A few guidelines are provided below:

A. Decisions regarding statistical power (and the required sampling design) must be sufficient to support decision-making with regard to PDM outcomes, as discussed in section 4.3, Defining thresholds/triggers for potential monitoring outcomes and conclusions.

B. If demographic characteristics are monitored, this may involve a subset of characteristics monitored during the recovery period. If PDM planning undertaken during the latter stages of the recovery process indicates that a less intensive sampling effort would be appropriate after delisting, then any activities required to generate data to estimate sampling error, determine sample sizes or distribution, etc. should be completed prior to the delisting proposal. Baseline pre-delisting estimates and confidence intervals for each characteristic should also be obtained.

C. A few species with relatively large geographic ranges may face enough diversity in distribution patterns, threats, or other salient factors to warrant some variation in PDM across their ranges. Furthermore, monitoring of some species during the recovery period may have entailed variable approaches by partner states, tribes, or other cooperators; in such cases, maintaining continuity in monitoring methods through time may be more important than attaining uniformity in monitoring across the species' range in the PDM phase. However, the total rangewide PDM effort must furnish sufficient comparability for assessment of the species' overall status as required by section 4(g). Evaluations using data from similar but separate monitoring efforts may benefit by judicious application of meta-analysis techniques (see, for example, Egger et al. 1997).

D. Decisions regarding the sampling frame (e.g., limiting sample selection to accessible sites or sites where landowners will cost-share the data collection) and selection of a sampling strategy (e.g., simple random, stratified, cluster) should be based on the best professional judgment of the PDM planners. Such decisions must, however, incorporate appropriate caveats about potential introduction of bias and other possible effects on the validity of results and conclusions.

Example (hypothetical): A sample of active raptor nests will be monitored for productivity. To reduce travel time and cost, the sample nests will be randomly selected from the set of known nests located less than 3 miles from a road. The monitoring plan indicates that this scheme is likely biased towards over-detection of lowered productivity due to human disturbance. However, it may under-estimate impacts of unauthorized take of nestlings for falconry, if remote nests are the most vulnerable to this threat.

E. There are many good references and resources that may be consulted to assist resolution of sampling and other monitoring design issues. A few suggestions are provided in Appendix C.

4.5 Methods documentation

All monitoring methods must be clearly documented. This includes procedures for selecting sample units, data collection protocols, definitions of terms, monitoring interval and duration, statistical analyses, and changes due to adaptive management. For PDM plans that involve data collection by multiple cooperators, provisions should be made to assure and verify consistent and accurate observations and data recording. If it is anticipated that cooperators will use varying methods, then this should be specified in the PDM plan along with the implications for data evaluation. Reliable analysis of trends will also require consistent or comparable data collection across monitoring periods, especially if monitoring occurs at multi-year intervals.

Any assumptions underlying the selection of methods should be documented and explained. If alternative methods from those selected are available or recommended by experts, reasons for choosing the selected methods should be documented in the plan or elsewhere in the administrative record (see section 6.4, Administrative Record).

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5.0 Post-delisting Monitoring implementation

5.1 Paperwork Reduction Act requirements

The Paperwork Reduction Act of 1995 and its implementing regulations (5 CFR Part 1320) require approvals from the Office of Management and Budget (OMB) for collections of information necessitating 10 or more non-Federal entities to respond to identical questions during a 12-month period. Thus, OMB approvals will generally only be required for PDM of species with large geographic ranges that include substantial amounts of non-Federal land.

Each PDM plan that does trigger Paperwork Reduction Act requirements must obtain its own OMB approval prior to the start of monitoring. OMB requires a copy of the PDM plan in the request package so that they can have an idea of the types of information that will be collected and the associated burden to the public. Since the OMB approval process requires two comment periods (one 60 days, one 30 days) announced in the *Federal Register*, it usually takes 6 to 9 months to complete the approval process. The OMB approval is only valid for 3 years and therefore may have to be renewed several times throughout the life of the PDM.

5.2 Funding

While the ESA authorizes expenditure of both recovery funds and section 6 grants to the states to plan and implement PDM, Congress has not allocated or earmarked any special funds for this purpose to date. Funding of PDM activities, therefore, will likely continue to entail trade-offs with other competing endangered species' conservation needs. Decisions to request or allocate funding for PDM should also consider opportunities to utilize other Federal funding sources, such as Federal Aid in Fish and Wildlife Restoration Act, Tribal grants, State grants, Private Stewardship grants, or allocations for other Service management responsibilities (e.g., Migratory Bird Treaty Act, Marine Mammal Protection Act).

Notwithstanding the authority to provide funding for PDM and the merits of doing so, every PDM plan must include an Anti-Deficiency Act disclaimer, so that all readers understand that, by law, the Services cannot commit funds outside the current fiscal year. An example is provided in Appendix D.

See section 2.3, Relationship between post-delisting monitoring and monitoring needed for post-delisting management of the species, for discussion of funding monitoring activities in support of post-delisting management. Item D in Section 4.5, Sampling considerations, provides cautions regarding definition of the sampling frame to reduce costs or to take advantage of cost-sharing opportunities.

5.3 Reporting and evaluation

A final report summarizing monitoring results and a final conclusion with regard to potential outcomes (see section 4.3 of this guidance) should be completed at the end of the monitoring period as specified in the PDM plan (see suggested PDM plan outline, Appendix B). Review and interim evaluation of data collected should also be conducted after each monitoring period to appraise the status of the delisted species, and to identify any potential problems in data collection protocols and/or consistency of implementation.

Responsibility for preparation of interim reviews and final reports may be assigned to one of the Services, other Federal agencies, a state agency (especially if it has assumed the lead for PDM planning and implementation, per section 1.3 of this guidance), a contractor, or another party, as decided on a case-by-case basis. Approval of PDM evaluations and conclusions is the responsibility of the lead FWS Regional Director or of the lead NMFS Regional Administrator (with concurrence by Headquarters). See also sections 6.1.1, FWS responsibilities and approval process, and 6.1.2, NMFS responsibilities and approval process.

6.0 Administrative responsibilities and requirements

6.1 Agency responsibilities and approval process

6.1.1 Joint agency responsibilities

When jurisdiction for a species is shared by the Services (e.g., Gulf sturgeon, Atlantic salmon) or split (e.g., sea turtles), the Services will jointly develop a species-specific agreement, in conjunction with the states, to allocate PDM planning and implementation responsibilities. Such agreements may provide for shared PDM responsibility by the Services or may assign this responsibility to one agency.

6.1.2 FWS responsibilities and approval process

Unless otherwise agreed among the regions, all phases of PDM planning and implementation, except coordination with states, tribes, and other cooperating agencies and organizations in non-lead regions, are the responsibility of the lead Region charged with recovery plan development and preparation of the delisting package. A Notice of Availability for the complete draft PDM plan should be included in the proposed delisting rule published in the *Federal Register* (see section 3.2, Consideration during the delisting process). Review of public and scientific peer reviewer comments, revisions to the draft plan, preparation of the administrative record, and approval of the final PDM plan are the responsibility of the lead Regional Director, with the review and concurrence by the non-lead Regional Directors. Approval of PDM evaluations and conclusions, including consideration of any intra-Service or public comments, are also the responsibility of the lead Regional Director.

Non-lead regions will coordinate involvement of states, tribes, and other cooperating agencies and organizations in their regions, and provide the lead region with copies of all relevant correspondence, reports, meeting summaries, etc. Non-lead regions will provide the lead region with timely comments and concurrence/non-concurrence memoranda.

6.1.3 NMFS responsibilities and approval process

NMFS responsibilities and approvals differ from FWS' in that 1) the Headquarters office may be the lead for the PDM plan for turtle and certain marine mammal species, in which case it will be signed by the Director of the Office of Protected Resources, and 2) whether signed by the Regional Administrator (if it originates in the region) or the Director of the Office of Protected Resources, the Assistant Administrator must review and concur with the PDM plan prior to signing. All phases of PDM planning and implementation, except coordination with states, tribes, and other cooperating agencies and organizations in non-lead regions, are the responsibility of the lead Region or Headquarters office charged with recovery plan development and preparation of the delisting rule. A Notice of Availability for the complete draft Post-Delisting Monitoring Plan should be included in the proposed delisting rule (see section 3.2, Consideration during the delisting process), and both should get concurrence from the Assistant

Administrator in Headquarters. Review of public and scientific peer reviewer comments, revisions to the draft plan, preparation of the administrative record, and approval of the final PDM plan are the responsibility of the lead Regional Administrator or Headquarters Division Chief, as appropriate, with review and concurrence by the non-lead Regional Administrators and Headquarters. Approval of PDM evaluations and conclusions, including consideration of any intra-Service or public comments, are also the responsibility of the lead Regional Administrator or Headquarters Division Chief, as appropriate, but are subject to prior concurrence from the Assistant Administrator.

Non-lead regions will coordinate involvement of states, tribes, and other cooperating agencies and organizations in their regions, and provide the lead region with copies of all relevant correspondence, reports, meeting summaries, etc. Non-lead regions will provide the lead region with timely comments and concurrence/non-concurrence memoranda.

6.2 Scientific peer review

A focused scientific peer-review of the complete draft PDM plan is highly recommended and may be required under OMB's guidelines for implementing the Information Quality Act. Peer-review may be initiated as soon as the PDM plan is considered a complete, finished draft. Early peer review of the PDM plan will facilitate completion of any new baseline monitoring needs and resolution of monitoring issues prior to the delisting. If not accomplished earlier, however, the peer review may be conducted concurrent with the comment period on the draft delisting proposal. It will often be beneficial to seek scientists with particular expertise in monitoring issues pertinent to the delisted species to review the PDM plan, although care should be taken that they are not the same experts who will conduct the monitoring.

6.3 Notifications

PDM planning and implementation is an iterative process that should allow for appropriate modification as new information is acquired. Early stages of PDM planning may be documented in recovery plan revisions, with associated notifications.

The ESA contains no explicit requirements for either notifications or public comment opportunities relative to PDM planning or implementation. However, notification that the complete draft PDM plan is available for review and comment should be included in the proposed delisting rule or published in a separate *Federal Register* Notice. A formal *Federal Register* Notice of Availability for a draft PDM evaluation at the conclusion of monitoring and simultaneous posting on a Service website are highly recommended.

FWS Regional Directors and NMFS Regional Administrators should make conscientious efforts to keep interested stakeholders informed throughout the PDM planning process and provide them with timely updates of monitoring results. For example, the Services might maintain and update PDM plans and interim evaluations on their respective websites, and/or publish Notices of Availability for final PDM plans and evaluations. Publication of additional *Federal Register* Notices for interim reports is anticipated only

for the most high profile PDM efforts and is at the discretion of the FWS Regional Director or NMFS Regional Administrator.

6.4 Administrative record

Thorough documentation helps facilitate good decision-making and responsible stewardship of important resources. Furthermore, since PDM is a legal mandate, creation and maintenance of a thorough administrative record documenting the rationale for each PDM planning decision and all phases of plan execution are required to fulfill the Services' legal responsibilities. The following table indicates the minimum that should be included in the administrative record for PDM.

Table 1 – Minimum contents of a PDM Administrative Record

Document	Comments
Notes or minute of meetings held to design the PDM plan	
Correspondence relating to the plan, including communications from other agencies and the public, and responses to those communications	
Copy of letters to peer reviewers, if applicable	Peer review recommended
<i>Federal Register</i> (FR) Notice of Availability for review and comment, if applicable	FR Notice of Availability recommended; may accompany draft delisting rule
Working draft versions of the PDM plan that were circulated outside the agency	
Draft PDM plan	
Public and peer reviewer comments on draft plan, if applicable	
Final (approved) PDM plan	
FR Notice of Availability, if applicable	FR Notice of Availability recommended
Monitoring data or summaries	
Interim PDM analyses	
Draft PDM analysis at the end of the PDM	
<i>Federal Register</i> (FR) Notice of Availability for review and comment, if applicable	FR Notice of Availability recommended
Comments received on the draft PDM analysis, if applicable	
Final PDM analysis	
FR Notice of Availability, if applicable	FR Notice of Availability recommended

All components of the administrative record should document the role of the states in each phase of PDM planning and implementation.

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Appendix A – PDM planning and implementation outline

<u>Timing</u>	<u>Activity</u> [brackets reference pertinent sections of this guidance]
Develop recovery plan	Identify PDM as a recovery task [3.1] and discuss in monitoring section.
Develop 5-year reviews and recovery plan revisions	Appraise timeliness of PDM planning [3.1]
5 to 10 years prior to anticipated delisting	Initiate detailed PDM planning [3.1, Appendix A] - Determine roles and responsibilities of Service(s), state(s), and other partners [1.3, 1.4, 6.1.1] - Determine monitoring components [4.2] and define triggers for outcomes [4.3] - Define monitoring methods, frequency, duration [4.4, 4.5, 4.6]
5 years pre-delisting	Assure that collection of baseline data for PDM is underway (continuation of recovery monitoring for most species) [2.2, 4.2.1]
As soon as a completed PDM plan is available, but not later than comment period on delisting proposal	Conduct peer review of draft PDM plan [6.2]
Concurrent with review of proposed rule for delisting	Washington or Headquarters review/comment on PDM plan [3.2]
Concurrent with comment period on proposed delisting	Public comment period (with <i>Federal Register</i> Notice) on draft PDM plan [3.2, 6.3]
Following incorporation of public comment, peer review	Regional Director approval of PDM plan [6.1]
ASAP following approval of final PDM plan and every 3 years throughout life of data collection	Request Paperwork Reduction Act approvals from OMB for plans requiring information collections from 10 or more non-Federal entities per year [5.1]
As prescribed in PDM plan	Initiate data collection
Following each monitoring period	Interim review and evaluation of data [5.3, 4.3] Provide updates to interested parties via websites, etc. [6.3]
End of monitoring period as prescribed in PDM plan	Prepare draft PDM evaluation and conclusion [5.3, 4.3] Regional Director/Administrator approval of PDM conclusion [6.1] Notifications via <i>Federal Register</i> and websites recommended [6.3]
Ongoing throughout	Maintain administrative record [6.4]

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Appendix B - Suggested PDM plan outline

- I. Brief summary of the roles of all cooperators in the PDM planning effort
- II. Summary of species' status at time of delisting
 - A. Demographic parameters (range, abundance, productivity, survival, etc.)
 - B. Residual threats
 - C. Legal and/or management commitments for post-delisting conservation
- III. Monitoring methods, including sampling considerations
 - A. Definitions of terms
 - B. Procedures for selecting and locating samples
 - C. Field measurement and data recording procedures (including data sheet example)
 - D. Procedures to assure consistency of data collection across the species range and between sampling periods.
 - E. Frequency and duration of monitoring, power analysis
- IV. Definition of thresholds/triggers for potential monitoring outcomes and conclusions
- V. Data compilation and reporting procedures and responsibilities (how, when, and by whom)
- VI. Estimated funding requirements and sources (with Anti-Deficiency Act disclaimer)
- VII. PDM implementation schedule, including timing and responsible parties
- VIII. Literature cited

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Appendix C Recommended references

Egger, M., G. Davey Smith, and A.N. Smith. 1997. Meta-analysis: principles and procedures. *British Medical Journal* 315: 1533-1537 (<http://bmj.com/archive/7121/7121ed.htm>).

Elzinga, C.L., D.W. Salzer, J.W. Willoughby, and J.P. Gibbs. 2001. *Monitoring plant and animal populations*. Blackwell Science. 368 pp.

National Conservation Training Center - one week course on Monitoring and Adaptive Management for Endangered Species.

Steidl, R.J. 2001. Practical and statistical considerations for designing population monitoring programs. Pages 284-288 in R. Field, R.J. Warren, H. Okarma, and P.R. Sievert, editors. *Wildlife, land and people: priorities for the 21st century. Proceedings of the Second International Wildlife Management Congress*, The Wildlife Society, Bethesda, Maryland, USA.

USGS offers conference call/internet based monitoring courses (e.g., <http://www.pwrc.usgs.gov/brd/SamplingCourse.htm>)

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Appendix D - Example of an Anti-Deficiency Act disclaimer

Post-delisting monitoring is a cooperative effort between the Service[s], state, tribal, and foreign governments; other Federal agencies; and nongovernmental partners. Funding of post-delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the [species name] following removal of ESA protections. To the extent feasible, the Service[s] intend[s] to provide funding for post-delisting monitoring efforts through the annual appropriations process. Nonetheless, nothing in this Plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation.