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**Name of Organization:** USFWS

**Type of Organization:** Federal Agency

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**Project Title:** Great Lakes Lake Sturgeon Genetic Analysis and Plan

**Project Category:** Emerging Issues

**Rank by Organization (if applicable):** 0

**Total Funding Requested (\$):** 770,000 **Project Duration:** 2 Years

**Abstract:**

In order to better guide lake sturgeon restoration and enhancement efforts in the Great Lakes, resource managers need a better understanding of the genetic structure among populations. The purpose of this project is to develop and initiate a comprehensive and cohesive plan for assessing the genetic structure of lake sturgeon populations in the Great Lakes Basin. This project will assist natural resource agencies to identify the genetic make-up of populations within their geographic area.

**Geographic Areas Affected by the Project**

**States:**

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Illinois  | <input checked="" type="checkbox"/> New York     |
| <input checked="" type="checkbox"/> Indiana   | <input checked="" type="checkbox"/> Pennsylvania |
| <input checked="" type="checkbox"/> Michigan  | <input checked="" type="checkbox"/> Wisconsin    |
| <input checked="" type="checkbox"/> Minnesota | <input checked="" type="checkbox"/> Ohio         |

**Lakes:**

- |                                   |   |
|-----------------------------------|---|
| <input type="checkbox"/> Superior | <input type="checkbox"/> Erie                 |
| <input type="checkbox"/> Huron    | <input type="checkbox"/> Ontario              |
| <input type="checkbox"/> Michigan | <input checked="" type="checkbox"/> All Lakes |

**Geographic Initiatives:**

- |  |                                  |                                     |                                      |  |
|--|----------------------------------|-------------------------------------|--------------------------------------|--|
| <input type="checkbox"/> Greater Chicago | <input type="checkbox"/> NE Ohio | <input type="checkbox"/> NW Indiana | <input type="checkbox"/> SE Michigan | <input checked="" type="checkbox"/> Lake St. Clair |
|--|----------------------------------|-------------------------------------|--------------------------------------|--|

**Primary Affected Area of Concern:** All AOCs

**Other Affected Areas of Concern:**

***For Habitat Projects Only:***

**Primary Affected Biodiversity Investment Area:** All BIAs

**Other Affected Biodiversity Investment Areas:**

**Problem Statement:**

Interest in the restoration of lake sturgeon, as part of ecosystem rehabilitation, has become more clearly defined and continues to expand among natural resource agencies. Sound stewardship of fisheries resources requires a fundamental understanding of how populations are structured genetically and of the effects of anthropogenic forces on partitioning of genetic diversity. Identifying the genetic diversity present can provide managers and biologists with critical information to address important management questions. For example, the extent to which populations are genetically differentiated (and inferentially reproductively isolated) can be of importance in defining evolutionary significant units or management units. To date, traditional fisheries assessment methods (i.e., mark-recapture techniques) have failed to provide needed data. Therefore, genetics issues are at the forefront of lake sturgeon enhancement efforts. In order to better guide lake sturgeon restoration and enhancement efforts in the Great Lakes, resource managers need a better understanding of the genetic structure among populations. In the past, independent projects have been undertaken. However, there is currently limited applicable genetic information to support lake sturgeon recovery efforts within the Great Lakes Basin.

The report entitled: Great Lakes Lake Sturgeon Genetics Status Assessment: An Analysis of Samples, Methods, and Standardization (Lowie 1999), identified several discrepancies associated with standardized collection and analysis of genetic materials. The primary issue is that many agencies are collecting different tissue samples due to the numerous geneticists and their different analysis methods. Furthermore, if geneticists are using the same method, discrepancies can occur when different markers, which are developed by the individual geneticist, are used. The ensuing Great Lakes Lake Sturgeon Genetics Workshop (December 1999) addressed several of these issues; identifying information needs, standardizing collection and analysis methods, and identifying the next step to determine the extent of separation/mixing within Great Lakes lake sturgeon populations. From the workshop, biologists and managers determined that obtaining additional information on stock variation and stock identification was a high priority. However, geneticists specified that additional markers need to be developed to meet this request, as well as for supporting other genetics research (i.e. mating schemes/broodstock management). All participants agreed a large source of funding was necessary to accommodate such a research project with applicable results. This proposal addresses these needs under a comprehensive and cohesive framework.

**Proposed Work Outcome:**

This project proposal addresses the components of a large initiative to develop a management plan for lake sturgeon in the Great Lakes based on population genetics. The objectives of this project proposal are to (1) collect a suite of genetic samples from the most spawning populations available, and (2) develop a set of functional microsatellite and mitochondrial DNA (mtDNA) markers, which will provide the necessary information for (a) determining the extent of separation/mixing within Great Lakes lake sturgeon populations, and (b) standardizing the markers for future lake sturgeon genetics research.

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A minimum of eight, disomic microsatellite markers will be developed. Disomic markers will be developed in order to allow better utilization by and provide consistent analyses among researchers. Mitochondrial DNA markers will facilitate analyses of population structure and evolutionary relationship using phylogenetic methods not directly amenable to microsatellite data. Markers will be standardized by sending primers and DNA of known genotypes to all genetic laboratories that are currently or are planning to work on lake sturgeon. Stock structure analysis will be determined based on the genetic variation, particularly the degree of allelic differences between populations. A report on the genetic characteristics within and among Great Lakes lake sturgeon populations will be provided, in addition to a comprehensive genetics plan for managing Great Lakes lake sturgeon. Principle investigators will communicate research progress to specialists from environmental management agencies by organizing and conducting a coordination meeting at the end of each year of research. At the project end, reports and publications will be available to the scientific and public communities.

<b>Project Milestones:</b>	<b>Dates:</b>
Project Start	09/2000
Develop robust genetic markers	06/2001
Sample breeding populations not sampled	06/2001
Standardize markers with other labs	08/2001
Gather population specific genetic data	08/2003
Summarize all genetic data	05/2004
Develop Basin-wide Management Plan	08/2004
Project End	09/2004

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Project Addresses Environmental Justice

**If So, Description of How:**

Project Addresses Education/Outreach

**If So, Description of How:**

Although findings from this research will be available to the public, this particular project has little direct relevance to public education or outreach. Marker that are developed will be available from Genbank, allowing any geneticist access to the information. This project has direct benefit to the scientific community. Principle investigators will communicate research progress to specialists from environmental management agencies by organizing and conducting a coordination meeting at the end of each year of research. At the project end, reports and publications will be available to the scientific and public communities.

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**Project Budget:**

	<b>Federal Share Requested (\$)</b>	<b>Applicant's Share (\$)</b>
<b>Personnel:</b>	452,500	100,000
<b>Fringe:</b>	0	0
<b>Travel:</b>	82,000	50,000
<b>Equipment:</b>	15,500	0
<b>Supplies:</b>	169,000	0
<b>Contracts:</b>	24,000	0
<b>Construction:</b>	0	0
<b>Other:</b>	27,000	0
<b>Total Direct Costs:</b>	770,000	150,000
<b>Indirect Costs:</b>	0	0
<b>Total:</b>	770,000	150,000
<b>Projected Income:</b>	0	0

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**Funding by Other Organizations (Names, Amounts, Description of Commitments):**

This proposal has also been submitted for consideration by the Great Lakes Fish and Wildlife Restoration Proposal Review Committee and the Great Lakes Fishery Trust. No commitment has been made to date; however, opportunities for cost-sharing would seem beneficial by all parties and should be explored. In-kind support will be provided by state, federal, tribal, provincial, and private entities by collecting tissue samples for the genetics analysis.

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**Description of Collaboration/Community Based Support:**

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This project has direct relevance to restoration and recovery programs of several Great Lakes Basin waters. This study addresses research needs identified by managers and biologists at the "Great Lakes Lake Sturgeon Genetics Workshop" (12/99); genetic variation, genetic integrity, and stock identification. This project proposal has been forwarded to participants from the Genetics Workshop, which includes the scientific community and private environmental entities. Comments from these participants will be incorporated into the project if a full proposal is requested. Also, obtaining such genetic information is listed as an objective in the following management plans: the Lake Superior Committee's Lake Sturgeon Rehabilitation Plan; Michigan DNR's Lake Sturgeon Rehabilitation Strategy; Wisconsin DNR's Lake Sturgeon Rehabilitation Plan; the Lake Sturgeon Rehabilitation Plan for the Green Bay Basin; New York State DEC's Lake Sturgeon Rehabilitation Plan; the Lake Sturgeon Restoration Plan for Ohio Waters of Lake Erie; and, the Bay of Quinte Lake Sturgeon Management Plan. Also, this proposal addresses a number of the priority areas identified by the USFWS, Great Lakes Basin Ecosystem Team.