be tested by making predictions based on the hypothesis, designing a study, conducting the study and comparing the predictions against the resulting data and conclusions.

III.A. Conceptual Ecological Models

CEMs provide a visual framework or graphical representation for the current or hypothesized understanding of the central and lower Platte River associated habitats relative to target species, including the underlying hypotheses on how the driving forces, relationships, and processes impact the valued ecosystem components. CEMs are also used to identify competing hypotheses and research questions to be addressed by management, monitoring and research. During the First Increment, CEMs will be reviewed and evaluated, as information becomes available, and new questions, models and hypotheses will be formulated that may be used to modify management actions and monitoring and research.

By the very nature of adaptive management, CEMs will be reviewed on a regular basis and modified as warranted based upon findings within the adaptive management implementation. The Governance Committee will have final approval of the AMP, and thus the CEMs.

III.B. Hypotheses

For the Program, hypotheses deal with system processes (e.g., the role of sediment in channel morphology), system ecology (e.g., the way target species use the central Platte), and the response of target species and their habitat to Program management. CEMs were used by the AM Working Group to develop hypotheses and to identify areas of uncertainty and disagreement (i.e., competing hypotheses). The competing hypotheses regarding how the system "works" and what functions or effects various management practices are proposed to achieve are illustrated in the CEMs or they are easily derived from the CEMs as the alternate to the stated hypothesis.

During the July 1997 Cooperative Agreement, summary hypotheses were developed by the AM Working Group and are included in the tables below. Besides these hypotheses, the AM Working Group, Governance Committee, and other individuals have identified many other hypotheses that have not been prioritized or completely drafted and reviewed. This larger list of hypotheses is contained in Appendix C.

III.C. Conceptual Ecological Models and Broad Hypotheses

The AM Working Group created an overall conceptual model of the Platte River system (Figure 4). In developing the current system CEM, broad hypotheses were also developed and are included in the following table.

System Hypotheses
S-1: A combination of flow management, sediment management, and land management (i.e., Clear/Level/Pulse) will/will not generate detectable changes in the channel morphology of the Platte River on Program lands, and/or habitats for whooping crane, least tern, piping plover, pallid sturgeon and other species of concern.
S-2: A combination of non-managed flows, sediment management and land management (i.e., Clear/Level/Mechanical Maintenance) will/will not generate detectable changes in the channel morphology of the Platte River, and/or habitats for whooping crane, least tern, piping plover, pallid sturgeon and other species of concern.

System Hypotheses
S-3: Program management actions will/will not have a detectable effect on target species use of the associated habitats.
S-4: Program management actions will/will not be of sufficient scale and magnitude to cause detectable system wide changes in channel morphology and/or habitats for the target species.

The AM Working Group also developed CEM's for each of the target species (whooping crane, least tern and piping plover, and pallid sturgeon) and for the physical processes and wet meadows in the central Platte River. The following sections include each of the CEM's as well as the hypotheses, as developed at AM Working Group meetings, associated with various linkages in the CEM's as denoted by a numbered arrow.

III.C.1. Whooping Crane (WC) CEM

The draft CEM for whooping cranes (Figure 5) was developed using the process generally described above in Section III.A. Hypothesis corresponding to linkages in the CEM are found in the table below.

Whooping Crane Hypotheses
WC-1: Whooping cranes that use the central Platte River study area during migration seasons prefer habitat complexes and use will increase proportionately to an increase in habitat complexes. Characteristics of a Program habitat complex are defined in the Land Plan Table 1.
WC-2: Whooping cranes prefer palustrine wetlands to river channel, based on known migratory stopover habitats. Whooping crane use of the central Platte River study area during migration seasons will increase proportionately to an increase in palustine wetlands.
WC-3: Whooping cranes do forage in wet meadows and agriculture fields proportionate to their availability.
WC-4: In the central Platte River study area, whooping cranes prefer conditions created by species target flows and annual pulse flows.

III.C.2. Least Tern and Piping Plover (TP) CEM

The draft CEM for least terns and piping plovers (Figure 6) was developed using the process generally described above in Section III.A. Hypotheses corresponding to linkages in the CEM are found in the table below.

Least Tern and Piping Plover Hypotheses
TP-1: In the central Platte River study area, terns and plovers prefer/do not prefer riverine habitats as described in Land Plan Table 1 and use will/will not increase proportionately to an increase in habitat complexes.
TP-2: The maintenance of tern and plover populations in the central Platte requires/does not require that sandpits and river continue to function together to provide nesting and foraging habitat.
TP-3: Ephemeral nesting areas in the river are/are not needed for long-term nesting success of tern and plover.

Least Tern and Piping Plover Hypotheses
TP-4: Existing river flows influenced by drought, floods, hydrocycling, etc., do/do not provide a sufficient forage base (invertebrate/fish recruitment, survival, and correct composition) throughout the central Platte River study reach for populations of terns and plovers during the nesting season.

III.C.3. Pallid Sturgeon (PS) CEM

The draft CEM for pallid sturgeon (Figure 7) was developed using the process generally described above in Section III.A. Hypothesis corresponding to linkages in the CEM are found in the table below.

Pallid Sturgeon Hypotheses
PS-1: Current habitat in the lower Platte River is/is not suitable for adult and juvenile pallid sturgeon.
PS-2: Water related activities above the Loup River do/do not impact pallid sturgeon habitat.
PS-3: Non-Program actions (e.g., harvest, stocking, Missouri River conditions) determine the occurrence of pallid sturgeon the lower Platte River

III.C.4. Physical Process (PP) CEM

Draft CEMs and corresponding hypotheses regarding the overall physical processes of the Platte River, including wet meadows, are discussed in the following table and illustrated in Figures 8, 9, and 10. The CEMs were developed using the technical subgroup as described above in Section III.A.

Physical Processes Hypotheses Flow-Sediment-Mechanical Approach
PP-1: Flows of varying magnitude, duration, frequency and rate of change affect the morphology and habitat quality of the river, including: • Flows of 5,000 to 8,000 cfs magnitude in the habitat reach for a duration of three days at Overton on an annual or near-annual basis will build sand bars to an elevation suitable for least tern and piping plover habitat; • Flows of 5,000 to 8,000 cfs magnitude in the habitat reach for a duration of three days at Overston on an annual or near-annual basis will increase the average width of the vegetation-free channel; • Variations in flows of lesser magnitude will positively or negatively affect the sand bar habitat benefits for least terns and piping plovers.

Physical Processes Hypotheses Flow-Sediment-Mechanical Approach
PP-2: Between Lexington and Chapman, eliminating the sediment imbalance of approximately 400,000 tons annually in eroding reaches will: • Reduce net erosion of the river bed; • Increase the sustainability of a braided river; • Contribute to channel widening; • Shift the river over time to a relatively stable condition, in contrast to present conditions where reaches vary longitudinally between degrading, aggrading, and stable conditions; and • Reduce the potential for degradation in the north channel of Jeffrey Island resulting from headcuts.
PP-3: Designed mechanical alterations of the channel at select locations can accelerate changes towards braided channel conditions and desired river habitat using techniques including: • Mechanically cutting the banks and islands to widen the channel to a width sustainable by program flows at that site, and distributing the material in the channel; • At specific locations, narrowing the river corridor and increasing stream power by consolidating over 90 percent of river flow into one channel will accelerate the plan form change from anastomosed to braided, promoting wider channels and more sand bars. • Clearing vegetation from banks and islands will help to increase the width-to-depth ration of the river
PP-4: Higher water surface elevations resulting from raised river bed elevations can generate measurable increases in the elevation, extent, frequency and/or duration of growing-season high water tables in wet meadows within 3,000 feet of the river.

III.C.5. Priority Hypotheses and Looking Outward Matrix

An initial list of priority hypotheses to be tested was developed by the AM Working. Also, as the Program progresses, additional hypotheses are likely to be added or modifications made to the existing hypotheses using the process described in I.F.2 above.

Hypotheses are numerous and diverse and it is understood and agreed that not all hypotheses can or will be addressed or investigated due to time constraints (certain responses to management actions will take longer than the First Increment), physical limitations (only have so much water and land), cost constraints beyond the scope and/or available resources of the Program, or because they conflict with agreed upon policies. Therefore, hypotheses will be evaluated and prioritized with the following guidelines (the numbering system used in the guidelines does not reflect level of importance between different criteria).

Technical Guidelines (applied by ED, ISAC, and advisory committees):

1. Is there a scientific basis for the hypothesis based on existing data, information, and reviews?
2. Is there a critical interdependency with a high priority hypothesis?
3. Will testing the hypothesis limit the opportunities to test other high priority hypotheses?
4. Is the hypothesis on a critical path to achieve Program goals and objectives – nice to know versus need to know?