

## **2.3 Floodplain Values**

Human interaction with Illinois River Basin floodplains dates back thousands of years. The original human inhabitants utilized the biological resources of these floodplains. Later, when European immigrants arrived in the New World, they often altered floodplains to suit the needs of an agriculture society. Currently, as human scientific understanding of floodplain ecosystems accumulates, human relationships with floodplains are being reevaluated. Humans always valued floodplains for their tangible benefits to human society (e.g., food and water): now floodplains are increasingly valued for their less tangible benefits (e.g., flood control and recreation) and also for their intrinsic properties (e.g., wildlife habitat and nutrient cycling). This shift in values has led to the concept and practice of floodplain restoration.

TWI's Hennepin Levee District (HLD) restoration project is one example of humanity's evolving relationship with floodplains. However, not every member of the Hennepin community shares TWI's values. Some residents want to preserve the tradition of farming on the levee district. Others (the more economically motivated residents) perceive that the economic benefits of selling the land outweigh those of farming. The controversy over the restoration of the Hennepin floodplain exposes the different values that humans place on the use of floodplains. The recent value shift from using the HLD for agriculture to restoring the floodplain, has primarily been driven by economics on the part of the HLD landowners, and scientific exploration by TWI. An unexplored component of the restoration is the role of environmental education in facilitating the ability of people to change their value of floodplains.

## 2.3.1 Human Use of the Hennepin Floodplain

### Native Americans

Illinois River floodplains provided native people a more biologically productive resource base than that of the surrounding prairie and forest ecosystems. Annual flooding ensured the fertility of the floodplains, making these areas attractive to agricultural as well as hunting and gathering cultures. Despite the floods, the Illinois River floodplains were attractive to native peoples because of their food resources: the basin supported some of the richest inland fisheries and waterfowl hunting grounds in North America.<sup>1</sup> These floodplains also provided other accessible resources, including fresh water and building materials.<sup>2</sup>

Archaeological surveys in the HLD indicate a high potential for informative Middle (200 BCE to 400 CE) or Late Woodland (400 CE to 1000 CE) Period Native American sites (Table 2.3.1-1). The anaerobic property of hydrophilic soils, like those present in the Hennepin floodplain before the 1900s, led to the preservation of archeological material and is extremely important to archeology and related fields of study. Although the University of Illinois plans to conduct excavations in the near future, no accessible professional archaeological studies have been conducted within the HLD.<sup>3</sup> However, nearby archeological sites provide a basis from which to extrapolate the history of human activity in the Hennepin floodplain. To understand this history, we take a broader perspective and examine the settlement trends in the Illinois River Basin.

The Middle and Late Woodland Periods are cultural stages in a particular area such as the prairie peninsula.<sup>4</sup> The native people that inhabited central Illinois at the time of European contact belonged to a group called the Prairie, or Mascoutens, Potawatomi. This was one of the three divisions within the Potawatomi tribe, whose homeland stretched into areas of Wisconsin and Michigan (other divisions include the Forest and Ojibwa).

Woodland culture and economy was based on intensified native patterns of hunting and gathering as compared with earlier periods. Groups began to move around less while using a wide range of naturally available resources. The Woodland period was a time of increasing plant use; a change that could have led to demographic changes, including increased sedentism.<sup>5</sup>

Table 2.3.1-1 Periods of Prehistoric Illinois

Dates	Periods	Phases
2,000	Historic	
1,000	Mississippian	Hubar, Langford, Fisher
0 CE	Late Woodland	Effigy Mound
500	Middle Woodland	Havana
1000	Early Woodland	
3000	Late Archaic	
6000	Middle Archaic	
8000	Early Archaic	
10,000 BCE	Paleo-Indian	

Plant materials were used for food, medicine, and other purposes.<sup>6</sup> Woodland peoples gathered wild plants mainly in the spring and summer months. During the spring, edible roots were dug, while at their most tender. In the summer, people collected berries, seeds, and other foods that required ripening before becoming edible.<sup>7</sup> Rose hips (*Rosa* spp.), bearberries (*Arctostaphylos uva-ursi*), and other plant foods were commonly stored for winter and emergency supplies.<sup>8</sup>

Archeological deposits indicate that some of the Illinois River Basin plants used by Native Americans included nut producing trees such as hickory (*Carya* spp.) and black walnut (*Juglans nigra*). Starchy-seeded plants, including goosefoot (*Cenopodium berlandii*), maygrass (*Phalaris caroliniana*), knotweed (*Polygonum erectum*), and little barley (*Hordeum pusillum*), served as the staples of the Woodland diet. Plants used for their oils included marsh elder (*Iva annua*) and sunflower (*Helianthus annuus*).<sup>9</sup> Maize (*Zea mays* spp.), a domesticated Mesoamerican plant, is not likely to have played a major role in the subsistence economy of the native peoples of Illinois until after the Woodland period: “it is only after AD 1000, during the Mississippian period, that it [maize] began to be cultivated by some groups as a staple.”<sup>10</sup>

The Native Americans used plants for other purposes as well (e.g., for dyes, soaps, decoration, insulation, weaving, and smoking). Plants commonly used for basketry included willows (*Salix* spp.) and wild roses.<sup>11</sup> Cattails (*Typha* spp.) provided fiber for insulation and the smoke produced by burning agrimony (*Agrimonia gryposepala*) repelled flies and wasps.<sup>12</sup>

While plants served mainly a utilitarian function, Native Americans valued animals for both utilitarian and spiritual reasons. Some of the most important species included birds of prey, waterfowl, deer, beaver, and muskrat.<sup>13</sup> These animals were admired for their ability to survive in floodplain ecosystems. The hunting, fishing, and preparation of such species made up an important part of daily life.

Many animal products were used for non-food purposes. For example, porcupine quills were commonly used for decorative purposes and the hides of various animals became clothing and shelter. Sinews (tendons) and other animal parts were made into a variety of domestic and hunting tools. The natural world not only provided sustenance for the people, but also served as the foundation of a cultural system of beliefs and manner of relating to the world.

### **Agriculture and Restoration at the HLD**

Since the 1500's, diseases introduced by Europeans significantly reduced the Native American populations. Furthermore, conflict and cultural change precipitated by contact with explorers, soldiers, and settlers led to the loss of native traditions. As the Europeans and later the Americans settled in the Illinois River Basin, the land use shifted from subsistence to agricultural production. Particularly in the last 100 years, massive engineering projects and intensive agriculture drastically altered the Illinois River Basin (Section 2.1.1). For example, at the Hennepin floodplain, engineers constructed a levee, while farmers drained the land and planted row crops. From 1908 through 2000, the HLD was used for agriculture, primarily for the production of corn and soybeans.<sup>14</sup>

Currently, through the efforts of scientists and educators, the value placed on floodplains is shifting their use away from agriculture and toward restoration. The value of floodplains for their natural functions and for the goods and services (other than agriculture) they provide to humans is becoming more apparent, while their value for agricultural production is increasingly questioned as shown by TWI's restoration project.

*Perceptions of the Restoration*

Some local residents believed that the HLD should remain agricultural, however. Many were initially resistant to TWI's planned conversion of agricultural land to a functional floodplain. The Putnam *County Record*, on July 21, 1999 captured this feeling when it wrote:

The Hennepin Drainage District has been in existence since the turn of the century. The impending sale of the almost 2,500 acres of land will not only mean the end of farming the ground, it will also be the closing in a chapter of Putnam County history.<sup>15</sup>

Clearly, the people of the village of Hennepin held mixed feelings about TWI's plans. Local newspaper headlines like "Hennepin Drainage District Will Mean the End of an Era" and "Plan has Farmers Digging in Their Heels", left TWI's staff concerned about the community's initial perceptions of the restoration project.<sup>16</sup> For the people of Hennepin, TWI's planned restoration also contained a disconcerting element of uncertainty. Local residents expressed concern over whether the restoration would become an "eyesore" and whether the numbers of mosquitoes would increase with the restoration.

Amid the controversy, the HLD landowners opted for practical considerations by weighing their economic costs against their net earnings. For some, the return on their investment in farming the HLD was less than if they invested the money elsewhere.<sup>17</sup> Similar economic reasoning affected the Village of Hennepin's decision to sell land that is the legacy of two former HLD landowners. The Peoria *Journal Star* wrote of this couple:

The late Mr. and Mrs. \_\_\_ gave the property to the Hennepin School District in the late 1930's to sell and use the money as the district saw fit. The district decided to keep the property and lease it to farmers for steady income. When the Putnam County School District was formed in the 1960's, however, officials decided the property should remain in Hennepin. Since then the village has owned and leased out the land for farming, with the proceeds benefiting the school district and funding scholarships for Hennepin-area students.<sup>18</sup>

When TWI proposed the purchase of the village's HLD land, the mayor of Hennepin felt that the village and the school district were better off investing the money from the sale rather than continuing to lease out the land. The return on the investment of TWI's offer of

\$1.2 million will meet the needs of the current program and likely allow for new development in the future.<sup>19</sup>

Another owner saw positive economic opportunity in selling her land, which had become a burden. After her husband passed away, she did not have the resources to farm the land herself and found it increasingly difficult to pay for the drainage and property taxes. Economic considerations were only part of her decision, however, as the *Peoria Journal Star* reports that she looks forward to the time when she will look out over the wetland from her adjacent property.<sup>20</sup> Economics were also not the sole concern for one couple who had built a home within the HLD that they were reluctant to sell. The *Peoria Journal Star* reported that this couple does not “agree with the ruin of more than 2,500 acres of good farm ground. And they don’t want to be neighbors with a wetland.” In the end, all the property owners of the HLD either sold or gave the right to the use of their land to TWI.<sup>21</sup>

### **2.3.2 Values and Functions**

The HLD landowners and TWI made a valuation trade-off between using the land for agriculture, as a restored floodplain, or for some other use. This trade-off was a measure of an opportunity cost, an opportunity cost being the “net benefit foregone because the resources providing the service can no longer be used in their next most beneficial use.”<sup>22</sup> For the HLD floodplain restoration, this opportunity cost certainly includes the foregone benefit of agriculture.

The purchase of the HLD by the eight ducks is the harbinger of the return of the floodplain’s natural functions (Section 1). Natural functions are the inherent interactions among the biological, chemical, and geological characteristics of an ecosystem. Some functions, defined here as goods and services, are useful to humans and are assigned value (human ethical judgments based on worth, utility, or importance). Goods are defined as material or physical products that can be bought and sold, while services are those functions that, while they cannot be materially exchanged, are useful to humans. Figure 2.3.2-1 illustrates the relationships between the ecology and the economics of the HLD, both in its past and future uses.

Floodplains may provide numerous goods and services for humans such as, ground water recharge, floodwater retention and control, nutrient cycling, sedimentation control, recreation, and habitat for a diversity of species (Section 2.1.2). However, no individual floodplain necessarily performs all these functions.

The specific goods and services a floodplain may produce depend upon how it is managed. In the past, Native Americans used the resources occurring naturally in the floodplain. In its current condition, with drainage channels, a pumping station and complete surface isolation from the main river channel, the HLD is set up for agricultural production. However, if managed differently, the floodplain may produce other goods (e.g., fish and /or waterfowl) or services (e.g., nitrate removal).<sup>23</sup>

However, trade-offs among goods and services are important to consider. For example, while the restored Hennepin floodplain will provide habitat for Illinois flora and fauna, it may also become a habitat for invasive species (Section 3.1.5).

### **Economic Values**

The potential economic uses of a restored floodplain are important to TWI. To initiate projects similar to the HLD restoration, TWI must find funding sources. It would greatly benefit TWI if restored floodplains were economically self-sustaining. What are economic values? An item has economic value if it is somehow useful or provides satisfaction to an individual or individuals. Often economic values are defined by an individual's willingness to pay for the item (a good or service).

Values related to the HLD as a floodplain include a variety of direct and indirect economic values. For some goods such as nitrate removal credits (a hypothetical example) the value is determined directly in a market where the items are sold based upon their current worth (Section 3.3.3). Other direct values such as flood control are more challenging to measure. The benefits of flood control are measured in terms of the avoided costs (prevented damages) of the flooding. These benefits are dependent upon the ability to accurately measure the damages (e.g., loss of human life or property).<sup>24</sup>

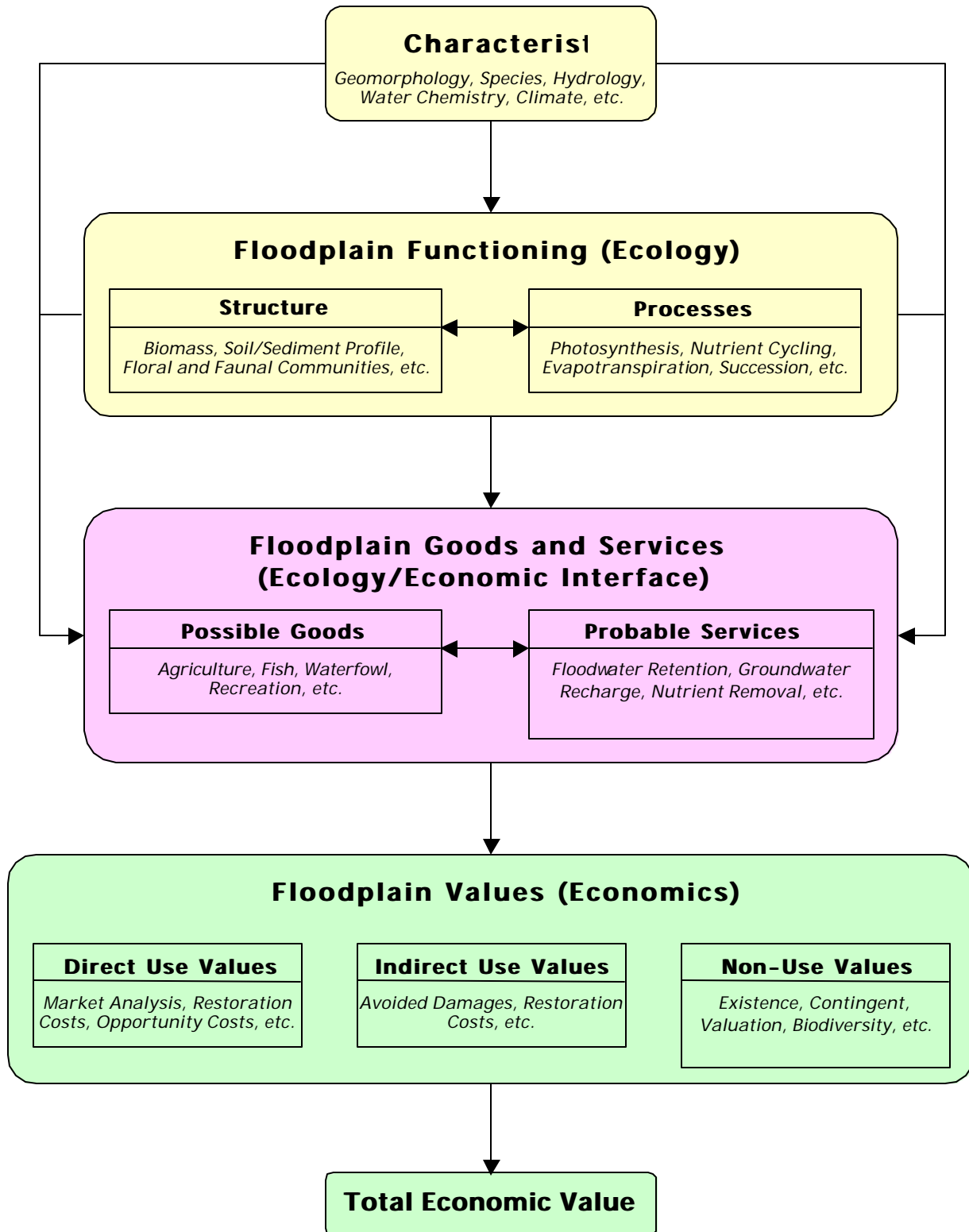


Figure 2.3.2-1. Relationships between the ecology and economics of the restored HLD.<sup>25</sup>



Indirect values, such as existence values (the value of the continued existence of a non-marketable place or resource, independent of its value for human use), cannot be measured directly and require valuation techniques such as contingent valuation. Contingent valuation is a technique used to place economic value on items without market value. For example, some people may value the existence of a floodplain for the ecological functions they provide rather than the economic benefit that can be derived by people.

Another means to look at economic values is through the concept of externalities. An externality “exists whenever the welfare of some agent, either a firm or household, depends directly on his or her activities and on activities under the control of some other agent as well.” There are both external costs and benefits.<sup>26</sup> An external cost occurs when the actions of one agent harms another agent. For example, farmers customarily apply more fertilizer to their fields than is necessary for maximum crop production (Section 2.2). Much of this excess ends up in the Illinois River and may cause local and regional problems. Despite the high costs of pollution cleanup, farmers have no economic incentive to change their current practices because the farmer does not personally pay for the pollution she/he caused. In this case, these cleanup costs, as well as the environmental and health costs, are external costs borne by society.

In contrast, there are also external benefits.<sup>27</sup> For example, several independent not-for-profit organizations, the ducks, purchased the land in the HLD and plan on restoring the floodplain. Likely floodplain functions include flood control, nutrient pollution reduction, and the creation of wildlife habitat: benefits valuable to society as a whole. However, while many people will benefit from the restoration, only the ducks pay for it thus creating an external benefit.

### **Educational Values**

Environmental education will play a valuable role in the restoration project. Because the restoration provides few obvious direct economic benefits, education can help people realize the value of restoring floodplains. For example, TWI plans to use the floodplain for nutrient cycling, wildlife habitat, and flood control. Through a well designed and thought out interpretative trail system, TWI can showcase these benefits to the site visitors (Section 4.2). School children will be encouraged to visit the site. Environmental education and

interpretation will enable teachers, parents, and other interested parties in the Hennepin region to become involved in the process of environmental learning (Section 3.2). Floodplain restoration advocates benefit, when the public gains a deeper understanding of the value of natural ecosystems to humans and in their own right. This understanding will make people more accepting and enthusiastic about restoration projects.

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<sup>1</sup> Asch, N. B. and D. L. Asch. 1986.

<sup>2</sup> Nicholas, G. P. 1998.

<sup>3</sup> McGowan, K. 1999.

<sup>4</sup> Green, W. 1993.

<sup>5</sup> O'Brien, M. J. 1987.

<sup>6</sup> Nicholas, G. P. 1998.

<sup>7</sup> Hungry Wolf, A. 1975.

<sup>8</sup> Markman, C. W. 1991.

<sup>9</sup> Asch, N. B. and D. L. Asch. 1986., and McConaughy, M. A. 1991.

<sup>10</sup> Markman, C. W. 1991.

<sup>11</sup> Hungry Wolf, A. 1975., Smith, H. H. 1933., Sweet, M. 1975., and Kindscher, K. 1987.

<sup>12</sup> Murphey, E. 1959.

<sup>13</sup> Hungry Wolf, A. 1975.

<sup>14</sup> Hey, D.L. 7/2000.

<sup>15</sup> The Putnam *County Record*. "Hennepin Drainage District Sale Will Mean End of an Era". July 21,1999.

<sup>16</sup> The Putnam *County Record*. July 21, 1999., and Hey, D.L. 7/2000.

<sup>17</sup> The project group gathered information about the site during site visits and personal communications with the residents and farmers. TWI provided additional information.

<sup>18</sup> Alberle, J. 6/5/2000.

<sup>19</sup> Coleman, K. 7/2000.

<sup>20</sup> Alberle, J. 6/5/2000.

<sup>21</sup> Hey, D. L. 4/2001.

<sup>22</sup> Tietenberg, T. 1996.p22.

<sup>23</sup> The project group gathered information about the site during site visits and personal communications with the residents and farmers. TWI provided additional information.

<sup>24</sup> Tietenberg, T. 1996. p71.

<sup>25</sup> Adapted from Turner, R. K. et al. 2000.

<sup>26</sup> Tietenberg, T. 1996. p47-48.

<sup>27</sup> Ibid. p48.

