

Those Dam Beavers

Design Document rev. 3

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I. Game Overview

The player controls a single woodpecker trying to destroy the dam, which is defended by 3 types of beaver enemies. The win condition is to destroy the dam. The lose condition is if you get hit a certain number of times by beavers that attack you.

The beaver squad has built a grand dam which prevents water from going downstream, causing creatures in other parts of the forest to go thirsty. The mischievous woodpecker must peck at the dam to weaken it enough for the water pressure behind the dam to shatter it, and give free water back to the creatures of the forest.

The game is played from a point of view looking straight at the face of the dam.

The woodpecker can fly around, and is safe from attack during this time. He can also land, clinging to the dam. Landing is necessary to attack the dam. He can also take off after landing, but cannot fly and is forced to land if he gets wet. He can be damaged by beavers and has a hit limit, and he can also get soaked from nearby water. If he gets soaked, he will automatically dry off after a certain amount of time spent away from water areas. While clinging to the dam, he can crawl along the wall too.

The beavers all can repair damaged spots on the dam. They can also all attack the woodpecker while he's landed by moving up to be adjacent to the player and using a melee range attack. They can crawl around on the dam to seek either the woodpecker or damage spots. Their potential targets have varying priority levels depending on distance from the beaver or severity of the damage spot. They won't seek the player if he's not landed. They also won't seek the player if he's outside their aggression range, which varies depending on beaver type. There are 3 types of beavers. Repair-beavers repair damage faster. Soldier-beavers move faster and have a longer distance at which they will go aggressive on the player. Soldiers also set seeking the player at a higher priority than other beavers do (in comparison to repair-work they might otherwise do). Overseer-beavers don't move or repair particularly fast, but will increase the movement and repair speeds of all beavers within a certain range. If the player is attacking a moderately damaged area, it increases the aggression range of all beavers. There is a maximum number of beavers that can actively be seeking the player. All other beavers will just continue repairing.

The dam has a certain amount of damage it can take before it collapses. The damage can be from attacks against any part of the dam the player chooses. The damage from

all the damaged areas is added up to determine whether the entire dam has been damaged enough to break. Damaged areas will become even more damaged over time if left alone. The more damaged an area, the worse the damage over time becomes. They can also be repaired or attacked. Areas have 4 visible states--undamaged, cracked, spraying water lightly, and spraying water heavily. There is a maximum amount of damage an area can have before it cannot be damaged further, but a single max-damage area isn't enough to destroy the whole dam. Areas that spray water have a chance to get the woodpecker soaked if within a certain range of the water. The more heavily spraying water has a higher chance of getting the woodpecker soaked. Beavers move adjacent to damage areas to repair them. If an area that is damaged suddenly starts to spray, any beaver in front of the spray hole gets knocked off the dam into the river and goes out of play. The player may cause enough damage to areas so they're about to break, and then lure beavers toward the break point so that if timed right, it will reduce the number of beavers on the dam.

Much of the strategy of the game is to figure out where the woodpecker can attack the dam safely and how to lure enemies into traps. In particular, overseer-beavers combined with repair-beavers can repair damage very quickly and stop the player from winning, so it may be necessary for the player to dispose of them. The player needs to understand the aggression ranges of the enemies to successfully lure them. Also, as the player makes more leaks in the dam, there's more water on the level, which makes it more likely for the player to get wet and be forced to land (and be vulnerable to attack), so placement of attacks is important so that the player doesn't hinder himself with his own leaks.

When the player wins, there is a display of the time taken to break the dam. Players can try to get a better time when they replay. The game also keeps track of the fastest time it was beaten in so players have something to compare to.

II. Game Mechanics

Overview

"Those Dam Beavers!" is a 2D single screen action/puzzle game where the player controls a single woodpecker attempting to destroy the dam, which is defended by multiple types of beavers. The goal of the game is to destroy the dam as quickly as possible while avoiding loss of "lives". That being the case, the game mechanics are designed in such a way as to allow players to manipulate their environment and enemies in order to achieve their goal.

Camera

In the game, the player controls Wally the Woodpecker by changing his position on a single 2D screen. The camera is set at an angle that allows the player to see the face of the dam at all times, and cannot be moved or changed. The camera will be at such a distance that the player will have a full view of the entire playing environment.

In-Game GUI

The game's user interface will be a simple representation of information important to the player.

Player Health: will be visually represented in the top-left hand corner of the player's viewing screen. The player will have three lives that they must moderate and can do so by checking this area of the UI.

Dam Health: will be visually represented in the top-right corner of the player's viewing screen. The gauge will represent how close the player is to completing the primary objective of destroying the dam.

Replaying and Saving

The player will have a set number of lives that must not be completely depleted in order to complete the current game. Once all lives are lost, the player must restart the game from the beginning. At this time there is also no sort of save function available to the player base.

Control Summary

The player will use a number of different controls to maneuver the woodpecker throughout the gaming environment. These controls are discussed in detail below. First however, is a summary of the different commands, which will give the reader an overview of the woodpecker's capabilities. The controls are designed to be used with a modern personal computer, desktop or laptop. However the design allows for porting to modern console controllers as well, such as the Xbox360, and can easily be adapted.

- **Up, Down, Left, Right (W, A, S, D):** The player will use this control to maneuver the woodpecker horizontally and vertically on the screen, whether climbing the wall or in flight. Combinations of this control scheme will allow the player to also move the character in a diagonal direction. Flight and climbing each have independent movement speeds.

- **Flight VS Climb Movement (Spacebar):** The player will use this control to toggle whether the woodpecker flies or climbs on the face of the dam. The player uses this control to either land or take off, depending on context. Take-off and landing each require a certain amount of time during which no other character control is possible, and any directional movement is halted. During this transitional period, the player is as vulnerable to attack as if climbing on the dam. Pressing the fly/land button interrupts any directional movement.
- **Action (left-mouse button):** The player will use this control to perform the "peck" action required to break the dam. The player holds down the button to continually peck at the section of the dam that is being clung to (directly behind the player sprite). Pecking is not possible during flight. Other character controls do not function while pecking. Each peck requires a certain amount of time to complete before the next peck begins, and each peck deals a certain amount of damage to the dam section. Even after the action button is released, player's current peck must complete before other controls become functional again. Pressing the action button will interrupt any directional movement while clinging to the dam. The player pecks at a particular rate per second.

General Movement

While the woodpecker is landed on the dam, the player can move upward, downward, left, and right in the game environment. The player will control the woodpecker's movement in these directions using the W, A, S, and D keys on the computer keyboard. Control is always relative to the camera's view of the world. Therefore, pressing upward on the controller will move the player toward the top of the screen, and vice versa.

Environmental Movement Effects

The woodpecker will be unable to take flight if "soaked" and furthermore, if the player is in flight when becoming "soaked" the woodpecker will proceed to fall off out of the screen and lose one "life."

Surfaces

The player will be faced with variety of different surfaces that affect in game mechanics and movement.

Firstly, and most simply the air in the foreground of the environment. The air is an area inaccessible to enemies, and for the most part provides a brief relief for the character.

Second, the wood on the dam. The wood can be navigated in any manner described by the control system, provided there are no obstacles barring the way.

Obstacles

In the game world, there are a few different obstacles the player will be forced to overcome.

First and foremost are the several different types of beavers that are attempting to both repair their dam while attempting to attack your the player. The player cannot move through these enemies while climbing and will lose a "life" if attacked.

Secondly are the water leaks made by your character throughout game. Minor leaks can be climbed across, but have a chance of putting the player in a "soaked" state. Larger leaks and gushing breaks in the dam cannot be moved through and must be navigated around. In addition, the large leaks prevent the player from flying through them as well as the climbing movement. If the player attempts to move through a large leak in flight, the player will get soaked, fall into the river at bottom of the screen, and lose a life.

- Lesser Spray Leak: slightly slows movement of anybody climbing across it, with a chance to get soaked
- Greater Spray Leak: cannot be traversed on dam and will cause the player to fall and lose a life if flown across in mid-air. If touched you will always get soaked when climbing along the dam. Simply climbing within a certain distance of the gushing break without touching it gives a high chance of being soaked.

*It should be noted that enemies climb on the dam and are hindered by climbing obstacles in the same way the player is. The AI pathfinding navigates around impassable obstacles like the Greater Spray. Being soaked is irrelevant to the beavers, since that state only impairs the player's ability to fly.

Soaking

Any sector of the dam that has a chance of soaking the player assigns a random amount of time that the player may be climbing within the sector before getting soaked. This random amount is determined when the player enters the sector. If the player remains in that sector when the time is up, the player enters the "soaked" state and cannot fly. The potential range of random soak times is consistent for any given type of sector, but the precise number is determined by each individual sector of the dam when the player enters that area.

For example, when the woodpecker enters a Lesser Spray sector, that sector determines how long the player can stay within that sector before getting soaked, which may be a different amount of time from what would be determined in other Lesser Spray sectors, or if the player returns to this same sector later. However, all Lesser Spray sectors have the same maximum and minimum amounts that this time may be.

A soaked woodpecker remains soaked until he has spent a certain amount of time outside of any sectors with soak potential.

Interactive Combat Environments

While destroying the dam is the key objective in the game, it is possible to combat the enemy using the very leaks that are being created by the player. If positioned and timed properly, the player can lure a beaver to walk across a leak when it is about to transition from being Cracked to a Lesser Spray. If a damaged area becomes a Lesser Spray while a character is climbing across it, the character falls off the dam into the river at the bottom of the screen. After this transitional period, the Lesser Spray area can be climbed across safely, but slows movement as described in the Obstacles section of the document. A beaver that is struck this way is effectively removed from play. A player who falls into the river loses a life. In addition, an area that transitions from being a Lesser Spray to a Greater Spray also pushes anyone climbing across it off the dam.

Dam Sector States

The woodpecker may attack any part of the dam he is climbing on. Causing damage to the dam creates a damaged sector of the dam at that location. Each type of sector has the same size on screen. Sectors have several properties. The sector's damage quantity is a number that contributes to the amount of damage necessary to destroy the whole dam. The sector's damage quantity also determines what state it is in, and its state determines its other properties. While in some states, sectors may take damage over time on their own even without being attacked. They may impair the movement of characters trying to climb across them. They may soak a player that remains within or near them too long. There is a maximum amount of damage that may be applied to any single sector. Each state also requires its own sprite animation (except for Undamaged).

Damage Quantity	State Name	Damage Over Time (per 0.5s)	Movement Reduction	Time Required for Soak
0	Undamaged	0	0	None
1-20	Cracked	1	0	None
21-50	Lesser Spray	2	50%	1-4s
51-100	Greater Spray	4	Impassable	0 (if touching); 1-4s (if within X distance)

If a sector is damaged enough, it transitions into a different state. Likewise, if it is repaired enough, it also transitions states. If a sector would be moved into a less severely damaged state by repairs, this transition is instant. The sector adopts the properties of a less severe state the moment the damage quantity qualifies it for that state.

However, if a sector would be moved into a more severely damaged state by an increasing damage quantity, it may enter into a brief transitional state before adopting the properties of the more severe state. This only applies to when a sector transitions from Cracked to Lesser Spray, or from Lesser Spray to Greater Spray. During this transition, the sector displays an animation of it about to break into a more severe state. The duration of this transition is randomly generated at the moment the sector takes enough damage to qualify for transition, and is always 1-2 seconds. During this period, the sector retains the properties of its pre-transitional state, even though its damage quantity places it in a more severe state. After the random transition duration expires, the sector adopts all the properties of the more severe state.

III. Artificial Intelligence

Since the game is based around the manipulation of both the enemy and the environment, the primary function of the game's AI is to provide challenge in this conflict. The AI will be essential in allowing players a strategic sense of accomplishment against a stimulating enemy.

Enemy AI

The only enemy AI present in the game will be that of the beavers attempting to repair the dam and thwart your plans to destroy it. There will be three primary types of beavers, all of which will be able to perform the same functionality, but at different rates. All beavers have a player vs. leak priority, meaning that they have to decide whether or not the player creating the leaks takes precedence over the leaks they are attempting to fix. While the player is in flight, the beavers do not consider the player a priority to seek at all. They also prioritize the repair of different leaks depending on the severity of leak state and distance between a particular leak and a particular beaver.

- **Repair Beaver:** The repair beavers focus primarily on their repairs, repairing leaks at a much quicker pace than the other beavers. They have the ability to attack the player if the player steps within a certain range of these beavers. However unless this occurs the beaver will normally ignore the player and continue repairing. The only exception is if the player creates a strong leak in a nearby area, forcing the beaver to try and fix that leak, or the player happens to be at a leak that the repair beaver approaches. At this point the repair beaver will attack the player. Their priority mostly stays with the leaks, however if they calculate that the player has been doing too much damage while landed, they will attempt to find the player.
- **Soldier Beaver:** The soldier beavers will repair leaks at a much slower pace than that of the repair beaver, however will search for the player at a greater distance and move faster. They also place a higher priority on the player.

- Overseer Beaver: These beavers do not move or repair particularly fast, but will increase both the movement and repair speeds of all beavers within a certain range.

*Priority: Priority is calculated by where the player is attacking and how much damage he/she is causing. If the player is attacking a moderately damaged area, it increases the aggression range of all beavers. i.e. Attacking a crack sector will cause all soldiers in an appropriate range to seek out the player. Attacking a lesser spray sector will cause all beavers within a certain range (and soldiers in a farther range) to attempt to attack the player.

If the player is within a particular aggression range of a beaver, and fulfills trigger requirements for that aggression range, the beaver will abandon its current repair target and approach the player to attack. Once a beaver moves adjacent to the player, it will attack with a tail swipe that knocks the player down into the river, causing the player to lose a life.

Beaver Type	Soldier	Overseer	Repair
Move Speed	10	8	7
Repair Rate (per 0.5s)	1	1	3
Special		Leadership aura augments beavers within X distance; Increases move speed by 20%; Increases repair rate by 50%; Effect is not cumulative with Leadership auras from other Overseers; Aura effect lasts while a beaver is in the aura and for 1 second after leaving the aura	
Range within which Player becomes priority target regardless of attack	10	5	1
Range within which Player is priority target if Player is attacking	20	10	2

Cracked sector			
Range within which Player is priority target if Player is attacking Lesser Spray sector	Full Screen	20	5

If the player's distance and actions cause the woodpecker to become the priority target for the beavers, the beavers abandon their current repair target to pursue the woodpecker. However, while not targeting the player, each beaver also has a repair priority that determines which damage sector it targets for repair. A beaver will move at its movement speed to be adjacent to its targeted sector and repair it. The beavers regularly check to states of all damage sectors. If there is a damage sector within a certain range that is at a more severely damaged state than its current repair target, it will target the sector in the worse state for repair. If there is a damage sector within a further range that is two or more states worse in damage severity, the beaver will target that sector. If a beaver ever has no current repair target, it compares the damage sectors within a certain range, choosing to target the nearest among those sectors with the most severe state. If there are no valid repair targets within this range, then it chooses the nearest damage sector among those sectors with the most severe state in the whole screen.

Range at which to change target to sector at least 1 state worse than current target	Range at which to change target to sector at least 2 states worse than current target
10	Full Screen

*There is a maximum number of beavers that can be actively seeking the player at once, all the others will continue repairing. Among the beavers for which seeking the player takes priority over their repair task, the 4 in closest proximity to the player will approach the player, while the others remain doing whatever they were doing before, which is likely repair work, but possibly nothing if there is nothing that needs repairing. The player is not a valid target if there are already 4 beavers targeting it. There is also a maximum number of beavers that can be targeting the same damage sector for repair. If there is already the maximum number of beavers targeting a damage sector, beavers ignore that sector for purposes of choosing new targets.

If the player manages to escape by flight while the beavers attempt to attack him/her, the beavers will attempt to fix the leak nearest to them at the time.

Beavers do not return after they are knocked into the river. However, a new beaver of a random type will climb up from the river onto the dam at random intervals. The time required for the next beaver to spawn and climb up is randomly generated at the start of

the game and whenever a beaver spawns. There is a maximum number of beavers that can be in play, so when the maximum is reached, the spawning is paused.

Changing Environment

The dam has a certain amount of damage it can take before it collapses. The damage can come from attacks against any part of the dam the player chooses. Damaged areas will become even more damaged over time if left alone, proceeding to a worse stage. The more damaged an area, the worse the damage over time becomes. They can also be repaired or attacked. Areas have 4 visible states--undamaged, cracked, spraying water lightly, and spraying water heavily. There is a maximum amount of damage an area can have before it cannot be damaged further, but a single max-damage area isn't enough to destroy the whole dam. Areas that spray water have a chance to get the woodpecker wet if within a certain range of the water. The more heavily spraying water has a higher chance of getting the woodpecker soaked. Beavers move adjacent to damage areas to repair them. If an area that is cracked suddenly starts to spray, any beaver in front of the spray hole gets knocked off the dam into the river and goes out of play. The player may cause enough damage to areas so they're about to break, and then lure beavers toward the break point so that if timed right, it will reduce the number of beavers on the dam.

IV. Art Assets

Object	Animations
Woodpecker	Flying Pecking Take-off Landing Cling to Dam Climbing Dam Cling to Dam, Soaked Climbing Dam, Soaked Pecking, Soaked Getting Hit Falling
Soldier Beaver	Climbing Repairing Tail Slap Getting Hit Falling
Overseer Beaver	Climbing

	Repairing Tail Slap Getting Hit Falling
Repair Beaver	Climbing Repairing Tail Slap Getting Hit Falling
Damage Sector	Cracks forming from undamaged surface Cracks vibrating as they approach burst Cracks burst into Lesser Spray Leak Lesser Spray Leak looping animation Lesser Spray bursts into Greater Spray Greater Spray animation
River	Animated water below dam Splash when character falls into river
Reservoir	Animated water at the top of dam
Dam	Area on which Damage Sectors appear
Forest Foreground	Trees and Bushes at edges of screen
Forest Background	Trees, Bushes, Sky behind Reservoir
Leadership Aura Effect	Appears on Beavers
Player Life Count	Icon representing remaining lives
Dam Damage Quantity	Bar showing progress toward break point Border and background for bar