

HOOD COLLEGE

DEPARTMENT OF COMPUTER SCIENCE
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The Beaver Game: Software Requirements Specification Document

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1 Introduction

This Software Requirements Specification (SRS) document will outline the goals and software requirements of the Beaver Game¹.

The Beaver Game adds an interesting twist to the established pixel simulation RPG video game genre. Playing as a beaver, the user will harvest dam-building items, bring them to a dam location, face predators, and more while watching the health of the game environment come to life.

1.1 Purpose



Figure 1: North American beaver (*Castor canadensis*). Image Source: [1].

The purpose of this game is to provide an immersive way to learn about how critical beavers are to the environment. Beavers are a keystone species and are crucial to the geomorphology of areas around rivers. Through their unique ability to alter the landscape, the rivers they inhabit are changed into highly diverse wetland ecosystems.

Beavers are an easy species to overlook. However, their work prevents droughts in dry seasons and prevents flooding in rainy seasons. The dams beavers construct act as the analogous kidneys of a watershed. A dam's filtering properties improve water quality by removing harmful pollutants. Beaver dams can help with mitigating forest fires as they increase water content and act as fire barriers. They can even help fight climate change by creating habitats that naturally absorb and store carbon emissions. Beavers have countless and extensive benefits to the environment. Figure 2 demonstrates the transformative power the beaver species has had on Susie Creek in Nevada, USA.

The ultimate pursuit of the game is fun and relaxation for the end user. This goal fundamentally drives the game mechanics, storytelling, art design, and

¹The name "Beaver Game" is a placeholder and will be thoughtfully chosen over the course of development. Until a final name is decided, "Beaver Game" or "the game" will be used interchangeably in this document.



Figure 2: Example of beavers’ impact on the environment. Susie Creek restoration of beaver population. Image Source: [2].

technology within the Beaver game. There is a current gap in the marketplace for beaver-related video games, particularly with the intent on education and entertainment. Designed with these core purposes, the game aims to captivate a wide audience and create a memorable experience that also connects the user closer to nature.

1.2 Intended Audience

This game will be released to the public. The easy-to-learn mechanics alongside the aesthetically pleasing graphics and audio will allow this game to be enjoyed by beginner and seasoned gamers. This game will be developed using the E10+ rating by the ESRB, meaning it would be best suitable for users over 10 years old to play. The audience of this game is anyone who has an interest in learning about how beavers are important to the ecosystem and/or is interested in fun, casual gameplay.

1.3 Intended Use

This game’s intended use is for the players’ educational benefit of learning how beavers affect the ecosystem in places where they reside. While informative, the Beaver game’s primary goal is fun and relaxation. This means it is best suited for personal use, not in an academic setting. This software is intended to provide a form of entertainment.

1.4 Scope

Main Goals and Objectives

This development project will deliver an enjoyable single-player, simulation RPG video game. What this project sets out to achieve is as follows:

- A fully functional simulation RPG video game with an endearing and informative storyline.

- Aesthetically and audibly pleasing design coupled with interesting and fluid gameplay.
- Intuitive mechanics of game assets including a main playable character, friendly and adversarial NPCs, and UI elements.
- A dynamic world map that reflects environmental health.
- Implementation of a strategic combat system that allows for skill progression of the player.
- Available on PC for Windows and Mac operating systems.
- Documentation covering the game design, development process, and user guide. Additionally, well-commented source code with and version control history.

A description of the game narrative and gameplay lies in Section 2.

Limitations and Exclusions

In the spirit of transparency and setting boundaries of scope, an outline of the current limitations and exclusions of features is made below. This project is constrained by a strict deadline of approximately 15 weeks. This list, though not exhaustive, provides features that lie outside the current scope of the project.

- Extensive Storyline and Cut Scenes: The game storyline will be kept minimal to focus on the development of immersive gameplay.
- Day/Night and Seasonal Graphics Cycle: A dynamic timekeeping cycle will be implemented, but will not affect graphics or season. The time-keeping will only impact how the user determines how to allocate their playtime and encourage working towards upgrades.
- Multiplayer: This game will be single-player.
- Console Availability: The game will only be available on Windows PC or Mac Platforms.
- Language and Accessibility Support: The game will only be available in English and will not feature comprehensive accessibility support.

1.5 Definitions and Acronyms

- Geomorphology: The science of the evolution of earth's topographic features, such as mountains, valleys, and rivers.
- ESRB: Entertainment Software Ratings Board. This is the group that rates video games for different age groups.

- **Keystone species:** A species that plays a critical role in maintaining an ecological community so much so that an ecosystem may not exist without that species.
- **Game Engine:** A game engine is a software framework designed to aid the development of video games by providing extensive libraries and editing support. The Godot game engine is utilized in this project.
- **Simulation Role-playing Game (RPG):** A video game genre that combines turn-based or real-time strategy with RPG elements. These elements include a player progressing a story to gain experience that improves their attributes and abilities.
- **Player Character or Playable Character (PC):** A fictional character whose actions are controlled by the user.
- **Non-Playable Character (NPC):** A fictional character whose actions are controlled by the programming within the game.

2 Overall Description

The main playable character (PC) is Castor, a beaver whose name originates from the scientific name for the North American beaver (*Castor canadensis*). Playing as Castor, the user will interact and manipulate a landscape based on North Eastern American forests. Castor's journey begins when he moves away from his beaver colony to start his young adult life. Unfortunately, all that is in the budget for a young beaver is a quite desolate and non-fertile stream. This does not deter our main character in the slightest. Castor makes it his duty to transform his new home!



Figure 3: The main player character, Castor. Art developed by Austin Couterman.

The driving force of game progression is the Environment Health Status. The restoration of the land is influenced by the level at which this status rests.

This will be depicted graphically in the game maps through three levels of environmental health levels ranging from desolate to thriving. An example of this progression through a pine tree can be seen in Figure 4. To improve the environment health status the player must progress their stats for water retention, dam upgrades, and lodge upgrades. This relationship of these stats is depicted in Figure 5. More explicit details on the features of the game lie in Section 3.

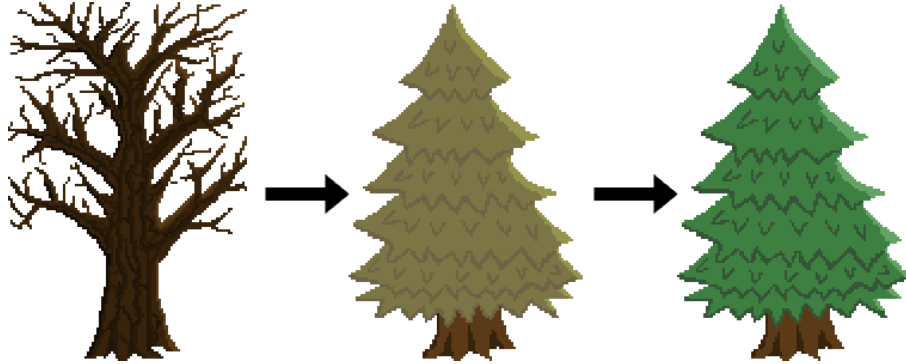


Figure 4: Environment Health Status influence on a pine tree. Art developed by Carrie Wasieloski.

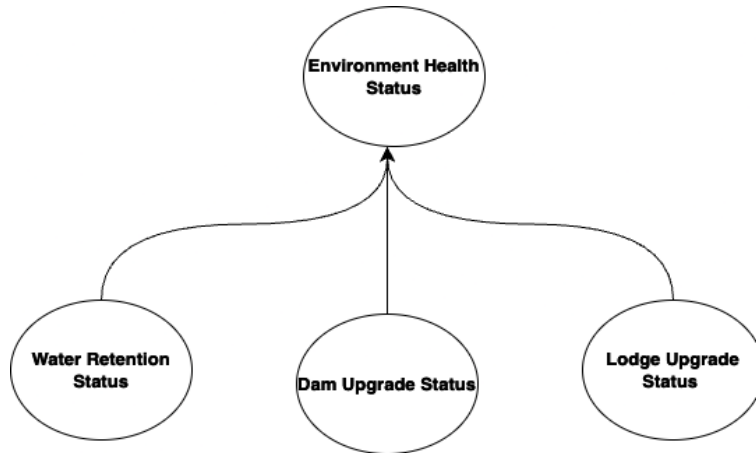


Figure 5: A high-level concept map of the relationship between game statuses.

Visually, the chosen aesthetic of the game will aid in developing a light-hearted and inspiring mood. The game will utilize a pixel art graphic style and a top-down, third-person point of view. An example of this art style, perspective, and point of view can be seen in Figure 6.



Figure 6: Example of pixel art style, top-down perspective, and third person point of view from the game Stardew Valley. Image Source: [3].

The project will utilize the Godot Engine and associated code will be developed using the GDScript language in the Godot Code editor or Visual Studio Code. Art and animation will be designed using Aseprite. Audio and music development will employ GarageBand and sound effects from Zapsplat.

2.1 User Needs

The user will need access to a computer with a monitor, a mouse, a keyboard, and a device to play sounds. An audio output device will enhance the user's experience through the many sounds and songs that the game will offer.

The recommended computing power required for users to run an exported Godot game, the Beaver game's chosen development engine, is as follows [4]:

- CPU: Windows: x86_64 CPU with SSE4.2 instructions, with 4 physical cores or more (ex. Intel Core i5-6600K, AMD Ryzen 5 1600).
macOS: x86_64 or ARM CPU (Apple Silicon) (ex. Intel Core i5-8500, Apple M1).
- GPU: For basic graphical compatibility, a dedicated graphics card supporting OpenGL 4.6 is required (ex. NVIDIA GeForce GTX 650 or AMD Radeon HD 7750).
- RAM: A minimum of 4 GB.
- Storage: A minimum of 150 MB of available storage to be used for the executable, project files, and cache.
- Operating system: Windows 10, macOS 10.15

These specifications ensure that the game runs smoothly and provides a good user experience on both Windows and macOS platforms.

2.2 Assumptions and Dependencies

This section outlines the assumptions and external dependencies that impact the delivery of the game.

Assumptions

This project assumes that there exists an end-user base interested in a game of this nature. It also assumes that said users have access to the required computing devices to play the game and a medium level of technical literacy and confidence with simple gameplay mechanics. The latter assumptions are reasonable to expectations from a user base with a previous interest in RGP video games.

Dependencies

The system is dependent on the Godot game engine for development and testing. Additionally, the pixel art and animation will be developed using the Aseprite software and will be integrated with Godot using the Aseprite Importer plugin. Reliance on these two resources and their integration is critical to the game but under no obvious threat of discontinuation. The risk associated with their availability is currently low.

3 System Features and Requirements

3.1 Functional Requirements

This section lists the functional requirements that are essential for the software organized by their corresponding system feature.

Playable Character:

- FR1** This system shall allow the user to move the PC using keyboard input.
- FR2** This system shall provide fluid mechanics for walking, swimming, cutting down trees, and combat.
- FR3** The system will allow the player to hold an inventory of wood pieces.
- FR4** The system will allow the player to allocate the wood to dam or lodge structures.
- FR5** This system includes the PC stats of health and strength, which are improved through in-game milestones (ex. cutting down 20 trees, and upgrading a dam).
- FR6** The PC shall pass out if the health stat reaches zero during predator attacks. If the player passes. then the player will re-spawn at home base with lost inventory.

FR7 If the health stat is improved, then the player has increased capacity to take predator attacks and has increased walking speed.

FR8 If the health and strength stats are improved, then the amount of time it takes to cut down trees, inventory capacity, and attack damage is increased.

FR9 If faced with a predator, the PC can interact with a bush to hide.

User Interface:

FR10 The system shall provide a main menu where users can load their saved game.

FR11 If the user is actively playing the game, a menu screen shall allow users to view inventory, game and character stats, configure audio settings, and the option to exit to the main without saving.

FR12 If the in-game menu is open, then timekeeping is paused.

FR13 A save station shall allow users to save game progress, load game progress, and/or exit to the main menu.

World Map:

FR14 The system has a main world map where the player resides and a forest map where players can be faced with combat and more resources.

FR15 The graphics are dynamic based on the environment health stat. When a stat level is achieved the land shall appear more fertile.

Timekeeping:

FR16 The game clock should simulate a real-life day where 24 in-game hours is equal to 1 in-game day.

FR17 The clock facilitates the implementation of the chopping wood feature, where upgrades to strength reduce the time required to chop wood.

FR18 The game shall allow players to observe the passage of time through an in-game clock display.

Dam and Lodge Structure:

FR19 Dam structures are to be built with a predetermined amount of wood pieces.

FR20 The dam system will have a health status impacted by the flow of water.

FR21 An upgraded dam structure increases water retention status and has more health status points.

Water:

FR22 The water retention function will impact the overall world health status.

FR23 Water will continuously impact dam health stat.

Combat:

FR24 A HUD (Heads-Up Display) provides the player with their health status.

FR25 If a player is faced with a predator, the player shall be able to hide from or attack predators.

FR26 Predators will be able to take idle walking status, attack mode, and search/stalking mode.

FR27 The NPC predators will have in-range PC detection to trigger attack mode.

3.2 External Interface Requirements

During the development of the game, the main concerns that impact the UX are the User Interface, sprites and animation, music, sounds, and appealing movement and controls. The user interface, in particular, should provide the user plenty of menus to interact with the game in more depth, allowing them to save and load the game, access their inventory and stats, modify game settings, and look at the map. The user should also be able to see the status of their dams and if they need to tend to them. The music in the game will also need to be able to cycle continuously without becoming too repetitive. The music and sound effects should be played in the correct context and there needs to be the ability to adjust audio levels or turn audio off entirely. The visuals will need to be appealing and recognizable to maximize the user's interest and prevent confusion.

The UX experience is also impacted during loading screens menus and cut scenes. Also, consistency in design elements, such as buttons, colors, fonts, etc., across the game is a critical component of the UI and UX.

3.3 System Features

System features that are required for the success of the game are listed below with descriptions.

- **Playable Character :** The user will play as the main PC, Castor, collecting wood pieces, allocating wood resources to dams, and hiding and attacking adversarial predators.
- **Non-Gameplay User Interface:** The system shall allow users to enter the game through a main menu. During gameplay, the system will allow the user to exit the main menu and view an inventory and stat screen.

Through a save station, the user shall be able to save and load game progress and exit the game.

- **World Map:** The World Map is integral to communicating the positive impact building a dam has on the environment. Determined by an environmental health status the world map will display as either desolate, moderately healthful, or fertile. The main world map houses the stream in which Castor resides and builds his dams and a forest map, where Castor can seek more wood at the risk of facing predators.
- **Timekeeping:** An in-game timekeeping system will impact the immersion and realism of the game by limiting the amount of progress the PC can make in a day similar to a real-life beaver.
- **Dam and Lodge Structures:** With the wood collected by the PC, a lodge which is the home of a beaver and a dam can be built. The Lodge provides the PC with passive wood. The Dam impacts water relation stats and will require upgrades and constant maintenance.
- **Water:** Water will act as an adversary to the PC progress by continuously impacting the health of their dams. Water retention will be tracked and is determined by dam quality. Water retention will ultimately impact the fertility of the in-game environment.
- **Combat:** Combat functionality will serve to enrich gameplay and demonstrate the challenges a beaver faces. Adversarial predators come in the form of a coyote or a fox, each with their unique attack stats. Combat takes place in the forest map, which will be required to enter to collect sufficient resources for dam building.

3.4 Nonfunctional Requirements

This section addresses the nonfunctional requirements of the Beaver Game.

Performance:

- Reasonable load times are required.
- A fluid and constant frame rate to provide a seamless graphics system.
- Mindful memory usage to be considerate of end users' system requirements.

Usability:

- A UI and control mechanics that are intuitive and clear that make movement, combat, and other game functions easy to use.

Scalability:

- The source code must be organized and thoughtfully designed where adding additional features is not increasingly laborious.

References

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- [3] ConcernedApe, “Stardew valley press,” <https://www.stardewvalley.net/press/>, 2023.
- [4] Godot Engine Documentation, “System requirements,” https://docs.godotengine.org/en/stable/about/system_requirements.html, 2023.