**OVERHAUL SUMMARY:**

Updating the current improvement system to this concept allows for the following:

* A cleaner interface view that will be a little more intuitive to use.
* The option to add in resource requirements for improvements which would allow lowering the cost and time requirements.
* The option to add on improvement upgrades to improve something to a higher tier.
* An easier plug-in style of adding prerequisites to each improvement.
* “Fields” that are continually used plots of land for each village or castle that function like a combination between improvements and enterprises. These will determine what kind of products a location produces, the kind of income it produces and has a strong influence on the base prosperity of the center.

**Design Concepts**:

* **Field Plots**:
  + Plots of land would be initially designated by the terrain type around a village.
  + Plots would be changed into specific field types using the improvement system for their build / cost amounts.
  + The sum of a location’s plots & improvements would determine the income from a location.
    - A minimum amount of a given stock should be maintained on hand (seen in the village elder’s inventory), but everything past that generated should be sold for profit as if taken to the nearby city for trade. This profit should be directly applied to rent.
  + Villages would be limited to a total of 10 plots of land.
* **Improvements**:
  + Improvements that use plots as a source of something (like wheat or cattle) will reserve the output of those plots.
  + Improvements should move to a total man hours required with a workdown rate calculated (like commissions do) instead of the native start hour / end hour system currently used. This would more easily allow emblems to enable boosts.
    - Improvements will be now built one at a time, but will allow queueing up three. This makes more sense considering workers will either be split between three projects or focus on one, but the same number of man hours will be worked. Why wait for project 1 so that project 2 & 3 can be done in parallel?
    - The number of workers available at a location will be based on that location’s prosperity.
  + Improvements should have an inbuilt system for tier improvements. A brewery that is tier 2 should be able to create more mead per week (and consequentially use more wheat & honey) for a higher profit margin. Adding a tier onto an improvement should be like adding additional capacity to that item. Reinforced walls would likely expand their effectiveness in delaying the start of a siege. Adding tiers to a specific improvement should be cheaper than the initial investment (maybe 50% of that cost & time).
  + Improvements should now require resources in the form of timber, stone and workers.
  + Improvements should have their prerequisites moved over to a plug-in system of constants similar to how troop recruitment prerequisites work.
  + The number of permanent structure improvements that can be built would be limited as follows:
    - Towns – 20, Castles – 12, Villages – 16
    - Village improvements take twice as much damage from raiding as town / castle ones do.
* **Owner Interaction**:
  + Players will now be able to pull food goods directly from the storehouse of their own village for free.
  + Whatever items are left in the storehouse at the end of each cycle will be sold with the exception of perishable items which are considered eaten or thrown out. Half of the money made from these items being sold is converted directly into rent income for the location.

**Improvements**:

* **Constant Types**:
  + Improvement Number – IMP\_\*
  + Prerequisites – IPREREQ\_\*
  + IMPROVEMENT\_FUNCTIONALITY\_THRESHOLD - Minimum damage % before loss of functionality.
  + Hub displays – IMP\_MODE\_\*
* **What to track (per improvement)** – Assign each point to a slot on a dummy “improvement data” troop temporarily via a script.
  + Cost to build (gold) – Int – 0
  + Total building time (man hours) – Int – 0
  + Extra time to build (days) – Int – 0
  + Relation change for completion – Int –1
  + Damage immunity – Boolean – False/0
  + Resource cost (Timber) – Int – 0
  + Resource cost (Stone) – Int – 0
  + Maximum Tier – Int - 1
  + Upkeep cost – Int – 0
  + Location Economy Factor – Int – 0 - % +/- change in center income.
  + Prerequisite 1 – IPREREQ constants: OTHER\_IMPROVEMENT, COASTAL, etc…
  + Prerequisite 2
  + Prerequisite 3
  + Prerequisite 4
  + Prerequisite 5
  + Prerequisite 6
  + Prerequisite 7
  + Prerequisite 8
  + Prerequisite 1 Focus – If a prerequisite aims at another improvement this stores the required improvement.
  + Prerequisite 2 Focus
  + Prerequisite 3 Focus
  + Prerequisite 4 Focus
  + Prerequisite 5 Focus
  + Prerequisite 6 Focus
  + Prerequisite 7 Focus
  + Prerequisite 8 Focus
  + Prerequisite 1 Data – Some prerequisite focuses require an additional data point (improvement tier, etc..).
  + Prerequisite 2 Data
  + Prerequisite 3 Data
  + Prerequisite 4 Data
  + Prerequisite 5 Data
  + Prerequisite 6 Data
  + Prerequisite 7 Data
  + Prerequisite 8 Data
* **What to track (per improvement, per location)** – Currently party slots. Possible file storage?
  + **Damage status** (% Functional) – Int – 100 – Tracks the possible destruction of an improvement as well as limits its functionality if less than 80% functional. Could be tied into mod difficulty setting for what the minimum functionality percentage is allowed prior to deterioration. Any value greater than 0 means the improvement exists.
  + **Improvement Tier** – Int – 0 – Allows the idea of building improvements again for a higher effect.
* **What to track (per location)** – Party slots
  + Improvement Building
  + Improvement Remaining Hours
  + Improvement Queue #1
  + Improvement Queue #2
  + Improvement Queue #3
* **Improvement Interfaces**:
  + **City View** (list view of current improvements, see Attachment 1)
    - Shows which improvements currently exist in a chart format:
      * Damage status, upkeep cost, improvement benefit summary
    - Shows current stores of timber, stone & space
    - Allows repairing of damaged improvements.
    - Allows destruction of built improvements.
  + **Build Queue**
    - Shows which improvements are currently being built.
    - Lists available improvements to build.
  + **View Surrounding Land** (Villages)
    - Shows a list of fields for planting crops, housing livestock or housing additional workers. (Attachment 4)
    - Displays uncultivated fields with an option to cultivate them for a price.
    - Each field in use should also display if any improvements are reserving their use.
  + **View Storehouse** (Village)
    - Displays what is in the village elder’s trade setup.
    - Allows the player to add or remove items from the village storage.
    - Requires the “Storehouse” improvement be built.
  + **Emblem Options**
    - Instant Completion (5) – Instantly complete construction of an improvement at this location.
    - Accelerate Construction (1) – Improve construction rate by 25% for one week on all improvements.
  + **Improvement Guide** (Debugging List)
    - Lists all improvements that exist regardless of building status or availability.
* **Functional Scripts**:
  + ***Improvement\_store\_data*** (improvement #) – Store all of the relevant stats about an improvement into a dummy “improvement data” troop file using troop slots. These slots can then be pulled individually with constants assigned to each slot for easier readability.
  + ***Improvement\_complete\_construction*** (improvement #, center #) – Handle any code related to completing the construction of an improvement at a given location. Notify the owner, remove it from that location’s building queue, improve relation, etc…
  + ***Improvement\_get\_name*** (improvement #, “caps”) – Converts an improvement # into a string name.
  + ***Improvement\_begin\_construction*** (improvement #, center #) – Handle process for assigning the given improvement # to an available building slot.
  + ***Improvement\_cancel\_construction*** (improvement #, center #) – Handle the process for ending the given improvement #’s work at a given center. This would be used when construction is ended prematurely.
  + ***Improvement\_destroy*** (improvement #, center #) – Handle the process for removing an improvement from a center.
  + ***Cf\_improvement\_can\_be\_built\_here*** (improvement #, center #) – Can fail script to check if a given improvement can be built in this location or not.
  + ***Improvements\_get\_economic\_impact*** (center #) – Tally all of the direct income adjustments (store to reg1) and all of the percent income adjustments (store to reg0).
  + ***Improvement\_takes\_damage*** (improvement #, center #) – Alters the functionality value for an improvement at a given center. Should call *script\_improvement\_destroy* if functionality is completely lost.
  + ***Improvement\_create\_summary\_insert*** (improvement #) – Creates the display insert seen in Attachment #1.
  + ***Improvement\_create\_build\_insert*** (improvement #) – Creates the display insert seen in Attachment #2.
  + Cf\_improvement\_has\_prerequisite (improvement #, IPREREQ #) – Checks if the given improvement has the given prerequisite and fails if it does not.
  + ***Improvement\_process\_ai\_thinking*** (center #) – Looks at the given center and returns the improvement the AI would prefer to build there.
  + ***Cf\_improvement\_exists\_at\_center*** (improvement #, center #, minimum tier) – Fails if the specific improvement (or it’s upgrade path) does not exist at the given center.
  + ***Cf\_center\_near\_terrain*** (center #, terrain type) – Fails if the given center is not near a source of the specified terrain type.
  + ***Infra\_add\_item\_to\_elder***
  + ***Infra\_remove\_item\_from\_elder***
  + ***Infra\_convert\_elder\_inventory\_to\_income***

**Attachment #1**: City View Interface / Improvement Inserts

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IMAGE | **Improvement Name (Tier \*)** (% Functional) | Upkeep |  | REPAIR |
| * Benefit 1 * Benefit 2 |  |  |

**Attachment #2**: Build Queue Interface / Improvement Inserts

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IMAGE | **Improvement Name (Tier \*)** | RESOURCES | PREREQUISITES | BUILD |
| * Benefit 1 * Benefit 2 | Gold  Time  Timber  Stone |  |

**Attachment #3:** Improvement Prerequisite Constants

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **IPREREQ** | **DESCRIPTION** | **FOCUS** | **DATA** |
| 0 | NONE | Blank place holder. | n/a | n/a |
| 1 | IMPROVEMENT | Building this improvement requires that another improvement already be built. This should be used for establishing improvement chains as well as same improvement tier upgrades. | The prerequisite improvement #. | Minimum tier |
| 2 | SEASIDE | The center this is being built in must be next to the sea. | n/a | n/a |
| 3 | RIVERSIDE | The center this is being built in must be next to a river. | n/a | n/a |
| 4 | MOUNTAINOUS | There must be mountain terrain near the center. | n/a | n/a |
| 5 | VILLAGE | This improvement can be built in a village. | n/a | n/a |
| 6 | CASTLE | This improvement can be built in a castle. | n/a | n/a |
| 7 | TOWN | This improvement can be built in a town. | n/a | n/a |
| 8 | FACTION | This improvement can only be built by the specified faction. This should be set up so that as long as the faction in question meets at least one of these prerequisites that it is acceptable. That way an improvement can be allowed for 2 or 3 factions, but be excluded to any others. | Faction #. |  |
| 9 | ITEM | Building this improvement requires a specific item to exist in the player’s inventory. These items will be removed upon starting construction. | Item # | Quantity |
| 10 | PLAINS | The center this is being built in must be near plains. | n/a | n/a |
| 11 | TUNDRA | The center this is being built in must be near frozen tundra. | n/a | n/a |
| 12 | RESOURCE | This improvement requires a specific amount of a resource per given week. | Resource type | Minimum # |
| 13 | BLOCK\_TERRAIN | This improvement cannot be built on the following terrain type. | Terrain type # | n/a |
| 14 | FIELD | This improvement requires a specific field type available. This is mostly used for converting one field type into another. | Field type # | n/a |

**Attachment #4:** Field Management Options

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **TYPE** | **DESCRIPTION** | **INCOME** | **UNLOCKS** |
| 0 | FIELD\_EMPTY | An uncultivated field. |  |  |
| 1 | FIELD\_FOREST | Source: Forest |  | Sawmill  Hunter’s Lodge |
| 2 | FIELD\_PLAINS | Plains near a center allow for these plots to exist and can be exploited by certain improvements for profit. This is effectively a plot of land made available, but nothing is being directly used on it yet. |  |  |
| 3 | FIELD\_WHEAT | Source: Wheat – 4 / week |  | Brewery  Windmills |
| 4 | FIELD\_BEEHIVES | Source: Honey – 2 / week  Note: Cannot be used in a tundra location. |  | Brewery |
| 5 | FIELD\_CATTLE | Source: Fresh Beef – 2 / week  Source: Leather – 2 / week |  | Slaughterhouse |
| 6 | FIELD\_HORSES | Source: Fresh Beef – 1 / week  Source: Horses – 2 (trade) |  | Ranch |
| 7 | FIELD\_HOUSING | Source: Prosperity treated as having a +20 bonus when determining the number of workers a center has.  Improves peasant growth for recruiting. (+0.5) |  |  |
| 8 | FIELD\_SHEEP | Source: Wool – 3 / week  Source: Fresh Beef – 2 / week |  |  |
| 9 | FIELD\_APPLE\_ORCHARD | Source: Apples – 6 / week |  |  |
| 10 | FIELD\_LEASED | This plot has been leased to another party for use. You will collect a small amount of income from it. |  |  |
|  |  |  |  |  |

**Attachment #5**: Field Management Interface Block

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IMAGE | **CATTLE RANCH** | RESERVED BY | PREREQUISITES | BUILD /  RAZE /  LEASE |
| * Provides 4 Fresh Beef per week. * Provides 2 Leather per week. * … | Slaughterhouse |  |

**Attachment #6**: Improvements

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **IMPROVEMENT** | **DESCRIPTION** | **REQUIREMENTS** |
| 1 | **Sawmill**  *Type: Structure* | * Increases this location’s timber generation by X. * Replaces the “Lumberyard” improvement. | Village / Castle |
| Cost: |
| Time: |
| Location: Riverside  Plot: Forest  Imp: Lumberyard |
| 2 | **Quarry**  *Type: Structure* | * Increases this location’s stone generation by X. | Village / Castle |
| Cost: |
| Time: |
| Location: Mountainous |
| 3 | **Hunter’s Lodge**  *Type: Structure* | * Adds 2 fur to village elder’s trade per cycle. | Village |
| Cost: |
| Time: |
| Plot: Forest |
| 4 | **Lumberyard**  *Type: Structure* | * Increases this location’s timber generation by X. | Village / Castle |
| Cost: |
| Time: |
| Plot: Forest |
| 5 | **Palisades**  *Type: Structure* | * Prevents armies from using mounted units in combat during a village raid or defense. | Village |
| Cost: |
| Time: |
|  |
| 6 | **Iron Mine**  *Type: Structure* | * Adds 2 iron to village elder’s trade per cycle. | Village |
| Cost: |
| Time: |
| Location: Mountainous |
| 7 | **Windmill**  *Type: Structure* | * Adds 4 grain to village elder’s trade per cycle. | Village |
| Cost: |
| Time: |
| Plot: Wheat |
| 8 | **Brewery**  *Type: Structure* | * Adds 2 mead to village elder’s trade per cycle. * Consumes wheat & honey from the storehouse. | Village |
| Cost: |
| Time: |
| Plot: Wheat, Plot: Beehives |
| 9 | **Slaughterhouse**  *Type: Structure* | * Increases the yield of fresh beef per cycle by 1 per tier. * Increases the yield of leather per cycle by 1 per 3 tiers. | Village |
| Cost: |
| Time: |
| Plot: Cattle Pasture |
| 10 | **Drying Racks**  *Type: Structure* | * Converts fresh beef from the village elder’s trade window into dried meat automatically. * Leftover meat is now sold at the end of a cycle instead of thrown out. | Village |
| Cost: |
| Time: |
|  |
| 11 | **Harbor**  *Type: Structure* | * Adds 4 fish to village elder’s trade per cycle. * Adds 1 oil to village elder’s trade per cycle. * Replaces the “Fishery” improvement. | Village |
| Cost: |
| Time: |
| Location: Riverside / Seaside |
| 12 | **Cultivate Field**  *Type: Transition* | * Converts an “empty” plot into a “plains” type. * One time generation of X timber. * One time generation of X stone. | Village |
| Cost: |
| Time: |
| Plot: Empty |
| 13 | **Cattle Pasture**  *Type: Transition* | * Converts a “plains” plot into a “cattle ranch” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 14 | **Build Sheep Pen**  *Type: Transition* | * Converts a “plains” plot into a “sheep pens” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 15 | **Plant Forest**  *Type: Transition* | * Converts a “plains” plot into a “forest” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 16 | **Cultivate Hives**  *Type: Transition* | * Converts a “plains” plot into a “Bee Hives” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 17 | **Plant Apple Orchard**  *Type: Transition* | * Converts a “plains” plot into an “Apple Orchard” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 18 | **Plant Wheat Field**  *Type: Transition* | * Converts a “plains” plot into a “Wheat” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 19 | **Construct Housing**  *Type: Transition* | * Converts a “plains” plot into a “Worker Housing” type. | Village |
| Cost: |
| Time: |
| Plot: Plains |
| 20 | **Seaport**  *Type: Structure* | * Allows sea travel to and from this location. * Unlocks the “harbor” menu location for centers. | Village |
| Cost: |
| Time: |
| Location: Seaside |
| 21 | **Storehouse**  *Type: Structure* | * Unlocks the “Visit Storehouse” menu location for villages. * Allows the player to pull items at no cost from the storehouse. | Village |
| Cost: |
| Time: |
|  |
| 22 | **Slave Barracks**  *Type: Structure* | * Allows slaves to be used as extra workers as long as the Slavery domestic policy for the area allows this. * Potential for a slave uprising that can immediately infest a village location with bandits and cause widespread damage to improvements. * Houses up to 10 extra workers per tier. * Upkeep: -50 denars / week. | Village |
| Cost: |
| Time: |
| Imp: Village Garrison  Policy: Slavery - Allowed |
| 23 | **Book Store**  *Type: Structure* | * Unlocks a book merchant at this location. One of the traveling merchants will settle down in this location permanently. * Income: +200 denars / week. | Town |
| Cost: |
| Time: |
|  |